POWER

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Noise

A GOLFER making a drive or a putt insists upon quietude. Nobody must speak or move. There must be nothing that will distract his attention, nothing that will detract from the intense concentration that, for a moment, he must impress upon the impact of that club with the ball.

But the same man sits down in his library in the evening to subject his brain to the intricate process of interpreting from the symbols of a printed page, the thoughts of others, weighing and considering them, indexing them and storing them away in the storehouse of memory.

And collaterally the jazz is turned on from the radio, the heavy trolleys pound their flattened wheels under his window, dogs yelp, automobiles fly past with tooting horns or stop with shrieking brakes and newsboys tear rents in the air with cries of "Whukstry."

As the blaze of approaching headlights on a narrow road, as the glare of untempered sunlight upon one's writing table, as the reflection of a false light upon a badly hung picture hamper the function of vision, so do distracting noises dazzle the brain and interfere with effective concentration upon the task in hand.

Oblivious as some are able to appear to all this, there is no doubt that the brain functions with more difficulty, and that if it performs its task as well, it does so at an unnecessary expense of nervous energy.

Harold Cox, the economist, writes:

> The fact that noise does not produce any visible effect on the human body possibly blinds the general public to the permanent injury done to human nerves by the constant noise to which we are all subject under modern conditions of life.

And Dr. Henry J. Spooner, of London, who has long been active in efforts to suppress preventable noises, speaking of the failure of the health authorities to protect the people from the harmful effect of noise as they do from the foul air, smoke, etc., says:

> There is a remarkable similarity in the insidious action of the poison inhaled that causes a gradual depression of the functions of nutrition and secretion and the gradual effect of noise on the nervous system.

An ever increasing proportion of human activity is becoming mental rather than muscular. Machinery is doing our work. We have more time to think, and it takes more thought and study to keep up with and understand and realize upon the possibilities of modern life.

Let us cut out the unnecessary noise and give the brain a chance.

F. R. Low

Second-Hand Turbine-Generator Changes Loss to Profit*

By C. A. CUTTING
Superintendent of Light and Water, Humboldt, Saskatchewan, Canada

SOMETIMES an unsuccessful plant can be made successful by some comparatively small change. The example of such a change which is given in this article is suggestive to others who are burdened with unprofitable plants.

THE town of Humboldt, Saskatchewan, Canada, owns an electric light and power plant which, the writer believes, underwent a unique modernization during the last two years. This plant primarily supplies light and power to the 1,800 inhabitants of the town. In addition, it operates in conjunction with the pumping and filtering plant of the water-works, located under the same roof, and also provides energy for a municipal sewage disposal plant, operated by remote control.

The operating staff includes one operating engineer for each eight-hour shift. Only one fireman is employed, on duty during one shift, the engineers of the other two shifts performing their own fire duties. A laborer wheels in the coal and takes out the ashes during one of the shifts, when the fireman is not on duty, and can help out the engineer if needed. A spare engineer is on the staff, who also does the repair work. Days off are granted when circumstances permit, no fixed rule being in effect. A lineman and meter reader has headquarters at the plant. The superintendent has his office also at the plant. One of the last three mentioned always remains at the plant in conjunction with the regular operating engineer then on duty. The duties of the staff have been described in detail in order to point out the means taken to obtain the maximum operating supervision with the minimum amount of labor engaged.

The plant consisted of the following machinery and equipment prior to the changes made which constitute the basis of this article: Two horizontal return-tubular boilers, 72 in. in diameter by 18 ft. in length, working pressure 150 lb., with lignite settings each fired by two sprinkler-type stokers. Two 72-in. by 14-ft. horizontal return-tubular boilers were also installed, which were actually the remains of the plant as built in 1914. These latter are not used now because they were constructed for 100 lb. working pressure. The main boilers are fed by a duplex outside-packed pump, steam driven, and of the reciprocating type.

The generating equipment consisted of the following: One 15 x 22 x 14-in. high-speed, tandem compound, side-crank engine, 277 r.p.m., directly connected to one 125-kva. generator, 2,300 volts, 3 phase, 60 cycles, exciter attached to the same shaft, also one 14 x 24-in. single-cylinder, single-eccentric Corliss engine, belted to a 125-kva. capacity generator with belted exciter, same voltage, etc., 900 r.p.m. One surface condenser was installed and serves these two sets. It is of the single-flow type and is of 400 sq.ft. capacity. The circulating water was taken from an artificial pond 80 x 160 ft., 4 ft. deep. A steam-engine-driven centrifugal pump with a capacity of 500 g.p.m. supplied the cooling water, pumping it directly through the condenser and discharging through a cluster of ordinary 4-in. pipes, directly into the pond, returning to the intake well through small screen chambers constructed at the extreme ends of the pond. The vacuum was maintained by a reciprocating steam-driven plunger-type pump.

Great difficulty was experienced with this condenser, the circulating water being fairly hard. As the capacity of the circulating pump was not sufficient to cool the condenser properly, considerable liming-up took place, which, of course, impaired the efficiency of the condenser further. The scale formed on the tubes was so hard that it could not be removed by mechanical means. Furthermore, it will be remembered that while this condenser was out of service and the staff were endeavoring to remove scale from the tubes, the engines were operating atmospheric, which was a serious state of affairs to exist in this particular plant.

The condensing system was unsatisfactory, 20 in. being the maximum vacuum obtained in the winter and 15 in. in the summer. Here I might mention that both engines had been rebored and fitted with new pistons and rings; the Corliss engine, in addition, had the valves rebored and new valves fitted; engines were indicated weekly and kept in first-class condition; boilers were absolutely sound and tight, and not one steam leak existed or was tolerated in the entire plant. In short, everything that could be done, under the circumstances, was done to improve the economy of the plant.

Owing to the hard nature of the water great trouble was experienced in lubricating the engines properly, the oil bill amounting to $2,500 per annum. In addition, the used cylinder oil was a serious menace in the feed water, it being necessary to filter the feed water through a tank containing excelsior before returning it to the boilers. The scale-forming properties in the water, together with the scum, made it imperative to remove all the tubes from each boiler at least every three years, this being a highly costly procedure.

At the close of 1924 the auditor handed in his annual statement showing a direct loss on operating of $2,945.41.

*This article was given commendation by the judges in the prize contest.

He also showed a total expenditure of $32,671.27 for the year to operate the plant. The revenue was $29,625.86, which makes up the deficit on operating as mentioned. The question was, how could the expenditure be reduced without impairing the reliability of the plant?

During 1925 every detail of operation was checked up, and it is doubtful if, under the existing conditions, more efficient operation could have been secured. The over-all expenditure was reduced to $31,602.03, but as the output in kilowatts had also fallen, together with a corresponding drop in revenue, we found that we still had a loss of $1,762.93 on operating. Summarizing these figures, it will be seen that the economy of the plant had not been improved.

By this time much adverse criticism was being leveled at the plant and sympathy in any of the plans to improve its efficiency was noticeably absent.

The coal cost per unit for the entire year of 1925 worked out at 4.33c. per kw.-hr. generated, as against 4.26c. for 1924.

Solution of the Problem

Taking for granted that the minimum number of men were employed in operating the three plants, as previously outlined, the only possible solution lay in reducing the steam used and increasing the revenue, which, under the circumstances, was possible only by taking on the load at a flour mill. This, however, could not have been done with the two units mentioned at a rate that would have proved profitable to the flour mill or the municipality. The solution appeared to be the purchase of a fully modern steam-generating unit of about 250 kva. capacity, the price of which was estimated at $25,000 installed. This, of course, would not correct the bad water feature nor

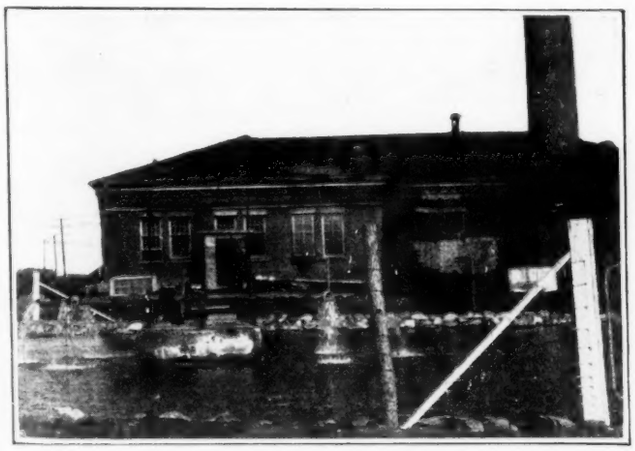


Fig. 1—Power-plant building with spray pond in foreground. When this view was taken, the spray nozzles had not been installed

would it lessen our oil troubles in the water. It looked as if we would have to spend in the neighborhood of $30,000 to overcome our difficulties. There was absolutely no possibility of securing this money through the sale of debentures owing to the fact that the town had incurred financial losses through local improvements in earlier days.

About this time a neighboring city had installed, as a temporary measure, a second-hand steam turbine generator of 250 kva. capacity. It was further learned that on the completion of the installation of a larger unit the small turbine set would no longer be required. The steam consumption of this turbine was estimated to represent a saving of at least 25 per cent over that of our Corliss engine when at its best. It was also learned that the engine generator and condenser could be purchased for $5,000 on convenient terms or monthly payments. Here,

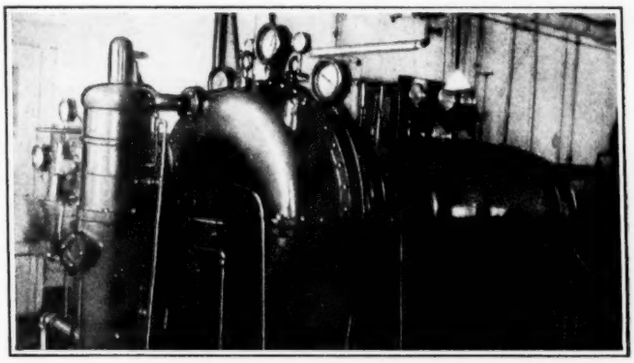


Fig. 2—The second-hand turbine generator that turned a loss to a profit

indeed, appeared a solution. An estimate was obtained on the additional necessary equipment to complete the installation, the following being required: One circulating pump, motor driven; one condensate pump, motor driven; one steam-air ejector; one motor-exciter; one weighing tank for supplying a continuous check on the performance of the turbine; one zeolite water softener; one set of spray nozzles for cooling water; one generator and exciter-control panel complete with instruments as follows: totalizing meter, power-factor meter, frequency meter; synchroscope; one set of draft gages; one CO_2 recorder; two hot-water meters for the two main boilers.

The whole equipment installed was estimated at $12,800 and was eventually put in at a cost of $12,500. The money was to be borrowed from the town treasury itself and was to be paid back within ten years.

Plans Meet Approval

In January, 1926, the Local Government Board, who control all expenditures of municipalities in Saskatchewan, were approached with a view to securing their permission to make the necessary expenditures in connection with installation of the turbine unit and accessories. It might be well to mention that this board consists of three members: The chairman, who is an authority on municipal law; a second member, an expert in municipal affairs; and a third member, who is a business man with public works experience. This board being advised in an engineering way by a municipal engineer of wide experience, their consent was readily secured.

In February, 1926, the unit was purchased and the auxiliaries were selected with great care. Considerable difficulty was experienced in deciding on the proper type of air ejector to be purchased. Remembering that the load ran down at times as low as 30 kw., if the air ejector selected used in the neighborhood of 600 lb. of steam per hour, this would bring the over-all steam consumption up to practically what the Corliss engine had been using. In any case a single-stage air ejector was

ultimately purchased and found to be very satisfactory. The exhaust of the ejector was piped and submerged into one of the old boilers, which was utilized in the following manner:

Operation of New Equipment

The condensate from the turbine was pumped by the condensate pump directly into the detaining chamber of the weighing meter on the main floor. After being weighed, it gravitated into a steel tank situated in the basement. A small motor-driven centrifugal pump handled the water at this point and operated against two heads, the main flow going into the two boilers connected in parallel and acting as hot-water reservoirs. The smaller flow was forced into an elevated tank at the top of the engine room, used as a supply tank for condensed water for the turbine glands and also for sealing the glands of the centrifugal condensate pump. The condensed water in the two storage boilers flowed by gravity through a float valve into a small, open, feed-water heater in the boiler room. The boiler-feed pump was the only steam auxiliary operating with the air ejector. It exhausted into the oil-intraining chamber of the heater. A zeolite water softener was installed on the main floor for convenient operation, with a cold-water meter fitted to the supply pipe to facilitate the process of regenerating and backwashing. The water meter is read every eight hours, and the engineers are held strictly responsible for the amount of softened water used for makeup purposes. The water softener discharges directly into the two old boilers, which are connected in parallel as previously described. All the traps discharge into these tanks and the temperature is maintained between 160 and 170 deg. F. As feed water flows to the open heater, the final temperature of the water entering the boiler is usually about 180 deg. F.

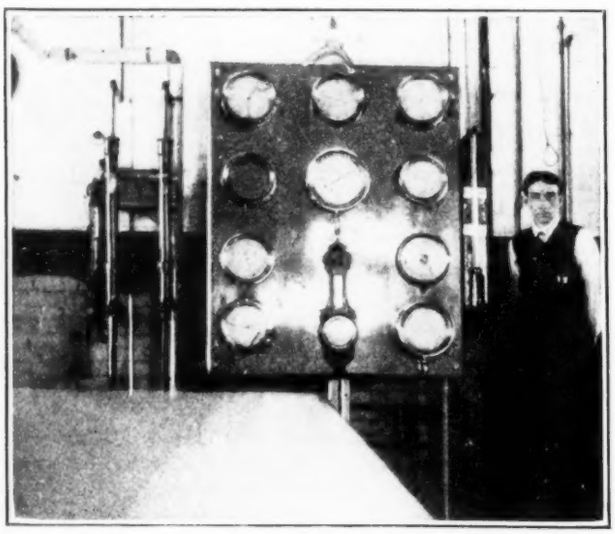


Fig. 3—Control panel with instruments for new installation in place

On July 2, 1926, the turbine unit, together with all auxiliaries, was placed on the line. The first stop was made on August 25, fifty-one days later. Only three short stops were made before the end of the year. The turbine and the motor-driven auxiliaries all ran smoothly, a great contrast to the old steam-driven auxiliaries, which were always a source of anxiety to the operators. The unit consumed about one-half barrel of lubricating oil in six months. No maintenance on any part of the equipment has been necessary, excepting two rings of packing added to the original packing of the circulating pump.

We realized that the most important feature in connection with the operation of this second-hand turbine was the maintenance of the very highest vacuum possible. We therefore constructed two mercury columns, one for measuring the vacuum in the condenser and the other for measuring the atmospheric pressure. All during the winter months we operated at one inch or less from the barometer, and the average vacuum at present is between 1.1 and 1.2 inches.

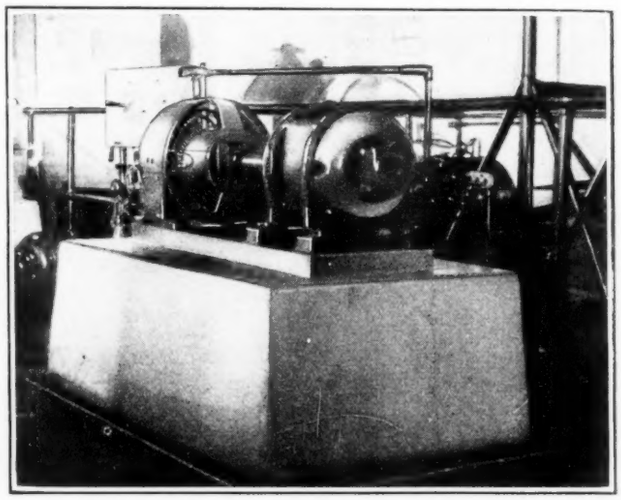


Fig. 4—Motor-driven exciter for second-hand turbine generator

After the reliability of the turbine had been established, all steam mains not actually in use were shut off in an endeavor to save every pound of steam possible.

Savings That Were Made by the Changes

At the end of the year a check-up was made and it was found that the Corliss engine, in conjunction with the high-speed side-crank engine, had consumed 16.12 lb. of coal per kilowatt generated, and for the last half of the year with only the turbine running, a coal consumption of 10.63 lb. per kw. was recorded. The auditors' figures for 1926 show that the over-all expenditure of the plant had been reduced to $28,529.23 as against $31,602.03 for 1925 and $32,671.27 for 1924. In 1926 the flour mill had been partly motorized and several other small consumers picked up, with the result that the revenue was increased from $29,839.10 for the previous year to $32,725.98 for 1926. This gave us a straight profit of $4,198.95, or, in two years, the plant's position had been improved to the extent of $7,142.16. Looking through the log sheets, we find that the coal cost per kilowatt generated for April, 1926, was 4.87c. with 2.51c. for April just concluded. We are burning the same grade of coal this year as we burned last year.

It is difficult to realize that the purchase of a second-hand turbine and the substitution of motor-driven

auxiliaries for steam-driven auxiliaries could have created such an economic change in any plant in such a short period.

The plant has made an arrangement with the treasury department of the town, whereby repayment of the $12,500 will be made, with interest at the rate of 6 per cent per annum, in sums of $2,000 per annum. From the figures submitted it is evident that we have had no difficulty in meeting these obligations. I could go on to describe what we are actually installing at the present moment, including superheaters, mechanical draft, with automatic damper regulation. But we have always before us on the bulletin board Mr. Low's editorial in *Power*, September 21, 1926, "Intention and Accomplishment." For that reason we are going to deal and are dealing only

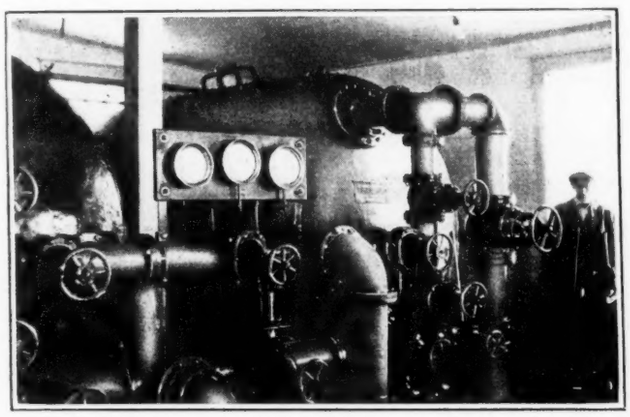


Fig. 5—Filtering plant for waterworks, located in same building as the power-generating equipment and served by it

with that which has been actually achieved. Adverse criticism has been overcome and confidence restored by this utility through the changes outlined in the preceding pages.

Electric Power in Italy

STATISTICS of electric power in Italy have been prepared by the Public Works Ministry, at Rome, for the last seven years. All material collected during 1926 is given in a special report and refers to about 2,700,000 kw. of installed capacity, of which 79 per cent (710 stations) is of hydraulic and 21 per cent is steam (162 stations). The electric power produced in these stations amounts to about 7,700,000,000 kw.-hr. and represents about 0.9 of the total Italian production, which has been estimated at about 8,500,000,000 kilowatt-hours.

Only 5 per cent of the total was produced in steam plants in 1926. During this period 223,000,000 kw.-hr. was imported from Switzerland, making the total electric power used during 1926 in Italy about 8,700,000,000 kw.-hr. Of this 12 per cent was used for illumination and heating purposes, 61 per cent for industrial motors, 9 per cent for railway traction and 18 per cent by the metallurgical and chemical industries. The amount of coal used during 1926 in the electric stations is estimated at 200,000 tons, which is only about 2 per cent of the 11,000,000 tons imported into Italy.

What Do You Know?

By L. H. Morrison

The answers are on page 674

IT WAS Oliver Herford, I believe, who asked that if a fool be sometimes an angel unawares, may not a foolish query be a momentous question in disguise? It may be, but you are not forced to apply the puzzle to the questions asked below. Each one is a sensible one, and the inability to answer them proves that some basic engineering or scientific principle or natural law is not fully appreciated by you. On the other hand, maybe the editor has strayed in his answers. If you disagree tell him so, and if he is wrong you will be paid for your correction if it is the first received.

Ques. 1—In the valves of the steam cylinders of a duplex pump which is the greatest, the steam or exhaust lap?

Ques. 2—What is the cause of a noisy dashpot on a Corliss engine?

Ques. 3—Will a poppet-valve engine give as sharp a cutoff as will a releasing-gear Corliss engine?

Ques. 4—Since the seam of a head is easier to rivet if the head is set concave into the boiler sheet, why are the heads of flush-front boilers not made convex?

Ques. 5—In a side-crank engine the pressure on the crankpin tending to bend it is the same as pressure tending to bend the shaft. Should the pin be as large as the shaft?

Ques. 6.—Could you operate a steam turbine after two rows of blading had been destroyed?

Ques. 7—When a locomotive engineer is starting a long string of cars, why does he not put the throttle in the wide open position so that the cylinders will have full boiler pressure?

Ques. 8—What is a Bilgrim diagram?

Ques. 9—Who first brought the steam-engine indicator into extensive use in this country?

Ques. 10—What is the difference between an automotive-landing type of elevator and an automatic-leveling type machine?

Guiding Boiler Operation from CO_2 and Uptake Temperature

By G. B. MULLOY
Mechanical Engineer, Motive Power Department, Armour & Company

IN THE boiler plant the big problem today is the maximum utilization of the thermal value of the fuel at the least cost. In this effort there has been considerable progress made in the large stations of public utilities, and, although over-all efficiencies of 90 to 92 have been obtained in certain cases, it seems that right now there is a pause in the attempts to do better and more consideration is being given to what may be called dollar efficiency.

Some businesses demand a quick return on the money invested, requiring that it pay back a certain percentage varying from a normal rate of interest to full investment charges in one, two or three years. The higher the rate and the shorter the period that the money invested must be returned, the greater the consideration that should be given to the initial investment. It is, therefore, well to stop and examine thoroughly each individual case. One problem may demand only a new form of operation and small investment to show big dividends, while others may demand radical changes such as entirely new stoking and boiler equipment. At this point, then, is met the problem of selecting the most efficient equipment based not alone on thermal efficiency, but also on the returns from the dollar invested.

CONTINUOUS records of CO_2 and boiler uptake temperatures, proper sizing of coal, maintaining the boilers clean and tight, are saving Armour & Company annually at least 90,000 tons of coal.

In burning coal on existing equipment, poor economy may result from the equipment, the operation or a combination of the two. In many cases the trouble is due to ignorance of what is actually taking place in the furnace and to the lack of a daily follow-up of the data that are obtainable for a small expenditure of money. No man in charge of burning coal should be charged with indifference, nor need he be possessed of a guilty conscience when he goes home at night, if he does not have the equipment necessary to determine whether or not he has wasted 5 or 10 tons of coal that day.

Opposed to the foregoing is the engineer who fails to taken advantage of his opportunities. As an example, the writer had occasion to visit a small plant where an appreciable investment had been made for steam-flow meters, coal-weighing apparatus, draft gages, etc., the object being to investigate the success of automatically weighing coal. Noticing all the metering equipment inoperative on the front of the boilers, the man in charge of the plant was asked what evaporation he was getting. The reply was "about 10 to 11 lb. of water per pound of fuel as fired." Checking up on the other equipment, it was discovered that there were no superheaters, air preheaters or economizers, no automatic draft control, and as the stoking equipment consisted of four chain grates operating on natural draft, the writer expressed surprise at the good evaporation and made inquiry as to the grade of coal being used. "Oh, we burn a good grade of Southern Illinois coal; let's see, it runs around 1,200 B.t.u. or is it 12,000?" Being assured that it was nearer to the latter figure on the dry basis, the next inquiry brought forth the more startling information that the flue-gas temperature on test showed 300 deg. and the CO_2 around 6 per cent—this in spite of the fact that the steam pressure averaged 150 lb. gage. It was quite evident that any kind of a meter meant nothing in the life of the man in charge of this plant.

"Clean and tight" is a good slogan for a boiler crew to follow, but it will never result in high economy without the proper control of the amount of air for a given grade of fuel and the maintenance of the proper flue-gas temperature for a given load condition and setting. It is the writer's experience that these two silent, unseen losses are in practice the most elusive and persistent. Carbon in the ashpit is more open, as close observation will show whether the ashpit loss is excessive or not.

Everyone in the business of burning fuel is familiar with excess air. It takes neither particular skill nor elaborate apparatus to find out about it. The CO_2 content of the flue gas is a direct and reliable index, and this can be determined with a hand-operated flue-gas analyzer, costing approximately $40. The great drawback to the hand method is that the results obtained are only "spot" samples, that indicate the excess or deficiency of air being supplied at that particular moment, and then only. Simple and reliable CO_2 recorders are now available that make one analysis after another and plot the results by successive lines on a 24-hour chart. A record of furnace draft on the same chart helps to explain the reason for the high or low CO_2 and is a help in controlling the damper, fuel bed thickness, stoker speed, etc. The draft that goes with the best percentage of CO_2 when the load is being satisfactorily met, is the draft to be used. Such a chart "talks" in direct terms about combustion efficiency, showing the ratio of air taken for a useful purpose to the air excess that is taken with wasteful results. Fig. 1 is presented to show the benefit of experience in obtaining uniformity of results.

Theoretically, just enough air should be used to burn all the carbon to CO_2 without having excess oxygen. Under practical conditions a perfect mixture cannot be assured. It has been found that in burning coal in other than a pulverized state, best results are obtained when approximately 40 per cent excess air is admitted. With this volume of air all the carbon can be burned, objectionable smoke can be avoided and a good furnace temperature can be maintained. Forty per cent excess air corresponds to approximately 15 per cent CO_2. With oil, gas or pulverized coal the excess air to insure proper mixture and good combustion may be reduced, and while it may be possible to get more than 15 per cent CO_2, it is not always advisable to strive for it. Fifteen per cent CO_2 indicates good efficiency with all ordinary fuels except natural gas, and for the latter 10 per cent CO_2 is considered good practice.

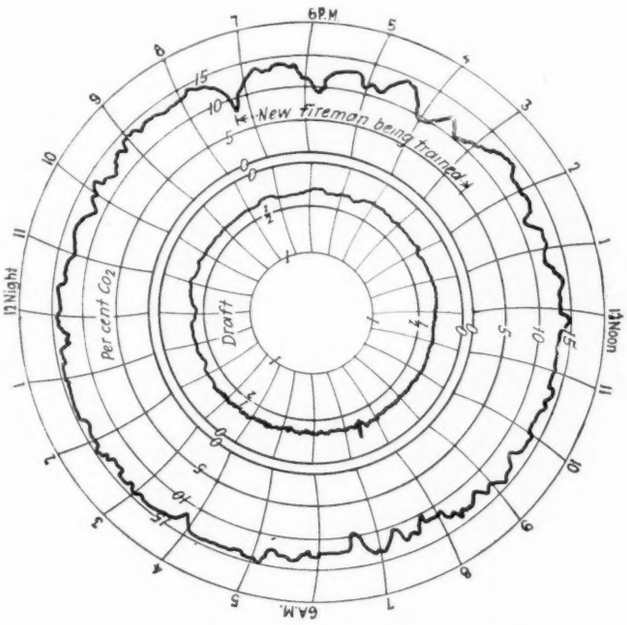


Fig. 1—Typical CO_2 chart showing the difference in results obtained by trained and untrained operators

Guide for Firemen Essential

In our operation dealing chiefly with chain grates, we have concluded that one sure guide for the fireman is to know constantly what CO_2 and flue-gas temperatures are being maintained. His load can vary, and there need be no penalty attached, should it vary, if he maintains the correct percentage of CO_2 and the proper uptake temperature. He has at least two methods of doing this with the chain grate, operated on natural draft. One way is to keep the fire up to, or within a few inches of, the waterback, leaving the damper wide open and carrying the correct depth of fire on the grate. The other method is to vary the thickness of the fire, keeping the grate covered as before and operating the damper. Whichever method he decides to use, it is, or should be, for the purpose of approaching as nearly as possible the theoretically correct amount of air for a given weight of fuel.

In the past the hand flue-gas analyzer required a man to manipulate it and the automatic recorder had not been fully developed in the dusty and strenuous service of the boiler room. We used quite a few of the early CO_2 recorders with a measure of success, but some operating troubles were experienced, causing us to stray away from the CO_2 method for a time and try various other methods and types of control instruments. During the last two years, however, we have made exhaustive tests of modern CO_2 machines and find them to be simple and reliable. When properly installed, it has been our experience that they give dependable information from which we are able to head off many wasteful practices and tendencies. Some of the things which the CO_2 and draft charts reveal are: Any change occurring in the proper operation of the coal-crushing machinery; any sagging or burning off of gate tile causing an uneven feed of fuel on the grate; clinker formation adhering to the side or bridge walls; changes in "porosity" of fuel bed due to uneven trimming of coarse and fine coal in the bunkers; excessive opening and closing of inspection doors; air leaks in furnace settings or ashpits, and the fireman's ability and watchfulness. Our experience is based upon the use of seventy CO_2 and draft recorders in twenty-four of our plants in the United States and three in South America, the fuel being coal, oil and natural gas, according to the plant location.

Uptake Temperatures a Good Guide

With reference to flue-gas temperatures it is good practice to take as a standard the uptake temperatures demanded on an acceptance test by the manufacturer of a high-class boiler. It is sure that he will state definitely what these temperatures should be for a given steam temperature, load, type of baffle, grades of coal and amount of heating surface involved. Once these temperatures are determined for a given installation and load, they should be rigidly adhered to and maintained. The operator in charge of the installation should be given a chart to follow. It is his problem from then on, and he will find it necessary to keep the heating surface clean, internally and externally. Table I is used at most

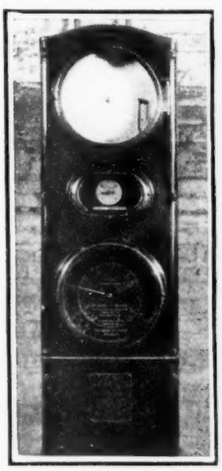


Fig. 2—Venturi meter that measures the feed water

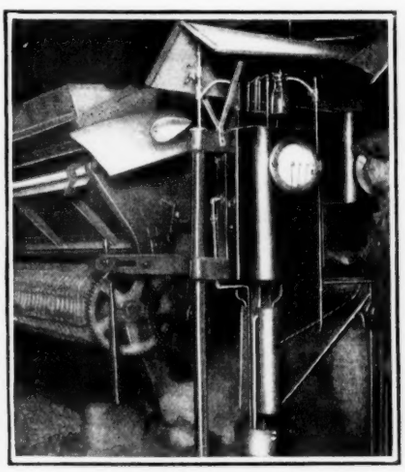


Fig. 3—Chief instruments used to guide operation are CO_2 and draft recorder, and recording thermometer on the uptake

of our plants, as it shows the temperatures that should be maintained for the three classes of vertical water-tube boilers with which we deal.

TABLE I—UPTAKE TEMPERATURES AT DIFFERENT RATINGS

	Class 1 (3 Banks x 6 Tubes, 18 Tubes Deep) Flue-Gas		Class 2 (3 Banks x 5 Tubes, 15 Tubes Deep) Flue-Gas		Class 3 (3 Banks x 4 Tubes, 12 Tubes Deep) Flue-Gas	
Rating, Per Cent	Temp. Deg. F.	Efficiency, Per Cent	Temp. Deg. F.	Efficiency, Per Cent	Temp. Deg. F.	Efficiency, Per Cent
100	445	76–77	475	75–76	505	73–74
150	530	75	560	74	590	73
175	575	73	605	72	635	71
200	620	72.5	650	71.5	680	70
225	680	70	710	79	735	68
250	730	68	760	68	790	67

Note:—Superheaters give about 15 deg. lower flue-gas temp. These data are based on burning coal containing 11,500 to 12,000 B.t.u.

Boiler-room operators are asked to use these temperatures as a guide and to check up on them when putting on the line a boiler that also is tight with respect to baffles. From a comparison of the daily observed flue-gas temperatures with those shown in the table, they know when to take a boiler off the line for cleaning or for repairing of the baffles.

To emphasize the fuel losses that accompany low CO_2 and high escaping temperatures, we mount in a conspicuous place in each of our boiler rooms a chart similar to **Table II, but worked out for the** grade of fuel used at that plant. The operators can see at a glance how much fuel is being wasted, and it gives them a keen interest in efficiency.

TABLE II—HEAT LOSSES IN DRY CHIMNEY GASES CORRESPONDING TO CO_2 CONTENT AND FLUE GAS TEMPERATURE

(Bituminous Coal)

CO_2 in Flue Gas, Per Cent Volume	Temperature of Flue Gases, Deg. F.						
	400	450	500	550	600	650	700
15	7.8	9.0	10.1	11.3	12.5	13.7	15
14	8.3	9.6	10.8	12.1	13.4	14.6	15.8
13	8.8	10.2	11.6	13	14.4	15.6	17
12	9.5	11	12.5	14	15.5	16.9	18.4
11	10.3	11.9	13.5	15.1	16.7	18.3	19.9
10	11.3	13.1	14.9	16.6	18.4	20.1	21.8
9	12.5	14.5	16.4	18.4	20.2	22.1	24.1
8	14.1	16.3	18.5	20.6	22.7	24.8	27
7	16.1	18.5	20.9	23.3	25.8	28.3	30.8
6	18.5	21.4	24.4	27.3	30.2	33.2	36.1
5	22.1	25.5	28.9	32.3	35.7	39.1	42.5

In looking over the table it does not take an alert boiler-room crew long to see that as the CO_2 rises in the first column, the heat losses decrease, but in raising the CO_2 the temperature is reduced, owing to the better heat absorption from a smaller quantity of gases, so the improvement trend is toward the upper left of the table. For example, increasing the CO_2 from 10 per cent at a flue-gas temperature of 600 deg. F. to 15 per cent CO_2 shows a reduction in heat losses of 18.4—12.5=5.9 per cent. In the process, however, the flue-gas temperature may drop to 550 deg., depending upon the condition of the heating surface, so that the reduction in heat loss would be 18.4—11.3=7.1 per cent. In a sincere campaign for fuel economy there are many such secondary effects that multiply the interest and the benefits and make it worth while even for well-operated plants to give special attention to the combustion process in the boiler room.

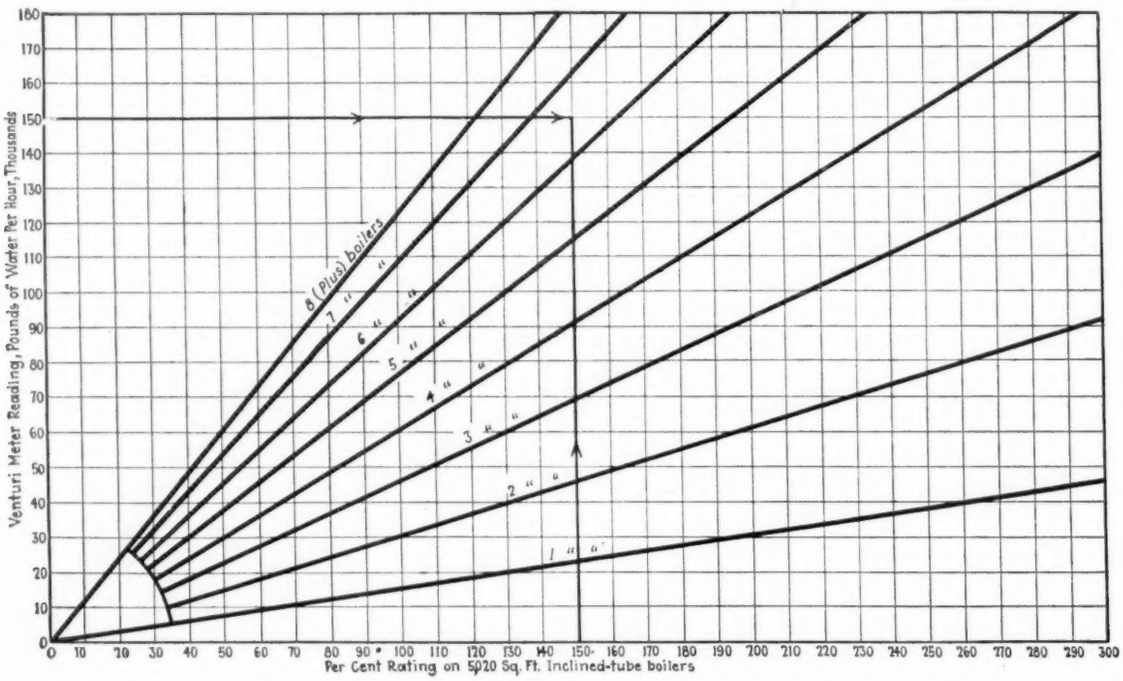

Venturi Meter Reading, Pounds of Water Per Hour, Thousands
Per Cent Rating on 5920 Sq. Ft. Inclined-tube boilers
8 (Plus) Boilers
7 " "
6 " "
5 " "
4 " "
3 " "
2 " "
1 " "

Fig. 4—Chart hung in boiler room to indicate number of boilers that should be on line.

It has been found that maximum economy results from operating the boilers at about 150 per cent of rating. In order that the firemen may know how many boilers will be needed to carry the load efficiently, the chart shown in Fig. 4 is hung up in the boiler room. Boiler rating is plotted against the total feed, so that the reading of the Venturi meter will at once determine the number of boilers to carry on the line.

Burning, as we do, approximately 1,000,000 tons of coal a year at the various plants, numbering twenty-four, under variable load conditions, we have found that following the slogan of "clean and tight," keeping correct flue-gas temperatures, maintaining the highest practicable CO_2 in the flue gases, as well as selecting and preparing the proper coal, pays large dividends. It is conservative to say that doing these things keeps the coal consumption 90,000 tons a year lower than it would be otherwise.

REFRIGERATION *for the Engineer*

Modern Two-Stage Ammonia Compressors

Typical Designs of Compound Compressors—Methods of Intercooling —Use of Clearance Pockets—Operating Methods

By F. N. Mac Neil

WITH the general adoption of purchased electricity in refrigerating plants, old inefficient operating methods had to be discarded. Since the monthly power bill depends upon the efficiency of the compressor, the last few years have witnessed the general introduction of compound machines. By cooling between stages the work of compression is reduced and the addition of clearance pockets permits variation in compressor capacity even though run at a constant speed, as is necessary in case of electric drive.

In Fig. 1 is shown the compound-compressor equipment of the largest electrically driven raw-water ice plant in the world, having a capacity of 1,000 tons of ice daily. This is one of the Arctic Hygeia Ice Manufacturing Co.'s plants in New York City.

The compressors were built and furnished by the Ingersoll-Rand Co. and consist of three 22½x15½x24-in. stroke and two 17½x12x18-in. stroke compressors. In Fig. 2 is shown a cross-section through one cylinder of the machine. The construction of the intercooler between stages, which is not shown, is of the shell-and-tube type. The clearance pockets are on top of the ends of the cylinder, but do not show in the illustration. The suction and discharge valves distributed radially around each end of the cylinder may be seen.

The cylinder heads are completely water-jacketed. The valves are placed radially around the cylinder and are arranged so that at least one inlet and one discharge valve are at the bottom of each cylinder, that the cylinder may free itself of any liquid that is taken over.

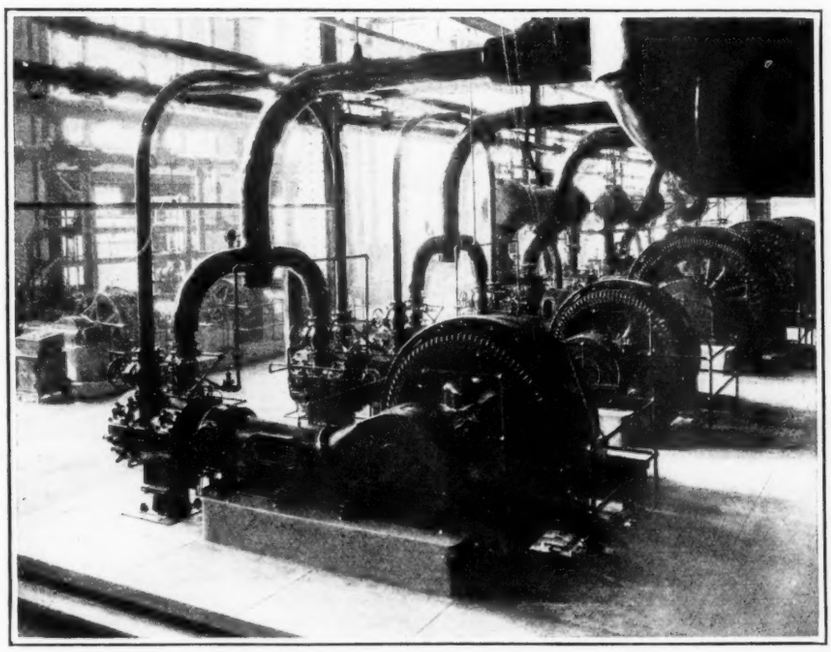


Fig. 1—Compound compressors in Arctic Hygeia Ice Co.'s plant, New York City

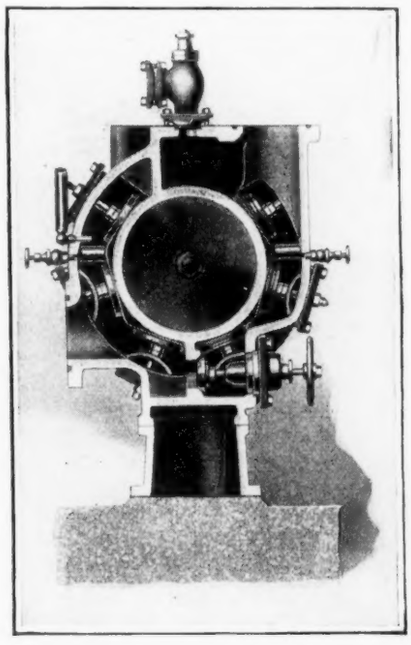


Fig. 2—Cross-section of Ingersoll-Rand compressor

REFRIGERATION *for the Engineer*

Each cylinder is fitted with a bypass cast integral with the cylinder and operated by a handwheel located at the bottom of the cylinder, as shown in Fig. 2. These valves are used to unload the compressor in starting. The clearance pockets are cast integral with each cylinder on the upper side at the ends. This location prevents liquid remaining in the pockets, should it find its way into the cylinder.

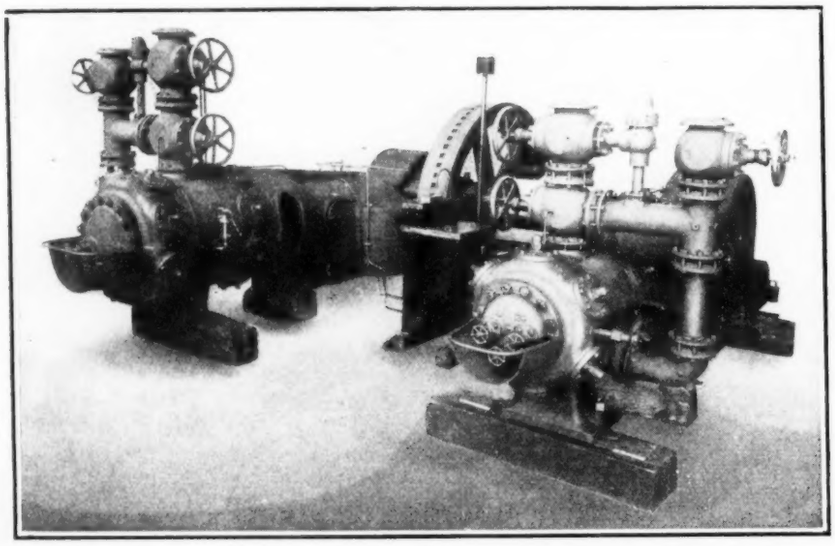


Fig. 3—York compound compressor in Merchants Refrigerating Co.'s plant

In Fig. 3 may be seen a two-stage compressor built by the York Manufacturing Co., of York, Pa. This compressor handles the summer load in what is probably the largest single cold-storage warehouse in the world, the Merchants Refrigerating Co.'s Tenth Avenue plant in New York City—five million cubic feet of refrigerated space under one roof.

The dimensions of this machine are: Low-pressure cylinder, 24x20 in., capacity, 18,095.6 cu.in. per revolution; high-pressure cylinder, 14x20 in., capacity, 4,310.3 cu.in. per revolution. The volume of the low-pressure clearance pockets which are located in the cylinder covers, are: No. 1 contains 312 cu.in., or 6 per cent of the cylinder volume; No. 2 pocket contains 602 cu.in., or 12 per cent, and No. 3 pocket contains 1,153 cu.in., or 24 per cent.

In the high-pressure cylinder No. 1 clearance pocket contains 103 cu.in., or 60 per cent; No. 2 pocket contains 198 cu.in., or 12 per cent, while No. 3 pocket contains 375 cu.in., or 34 per cent.

There are eight suction and eight discharge ring-type valves on the low-pressure cylinder, while the high-pressure cylinder has six suction and six discharge valves. Removing the cover on the side of the cylinder is all that is necessary to replace a valve after the machine is pumped out. The by-passes for unloading the compressor when starting under load are full pipe size, a desirable feature when starting with a synchronous-motor drive.

Gravity-feed lubrication is provided and all moving parts are easily accessible for inspection while the machine is running, another feature of great convenience. Pressure feed lubrication is provided for the glands, which are of great depth and easily accessible for packing and adjustment. There are no water jackets, as the highest gas discharge temperature seldom exceeds 170 deg. F.

The machine operates with a combination of water intercooling and ammonia intercooling. The suction gas at a pressure of from 2 to 4 lb. gage is compressed in the low-pressure cylinder to about 38 lb. gage, the temperature being around 1,630 deg. F. on discharge from this cylinder.

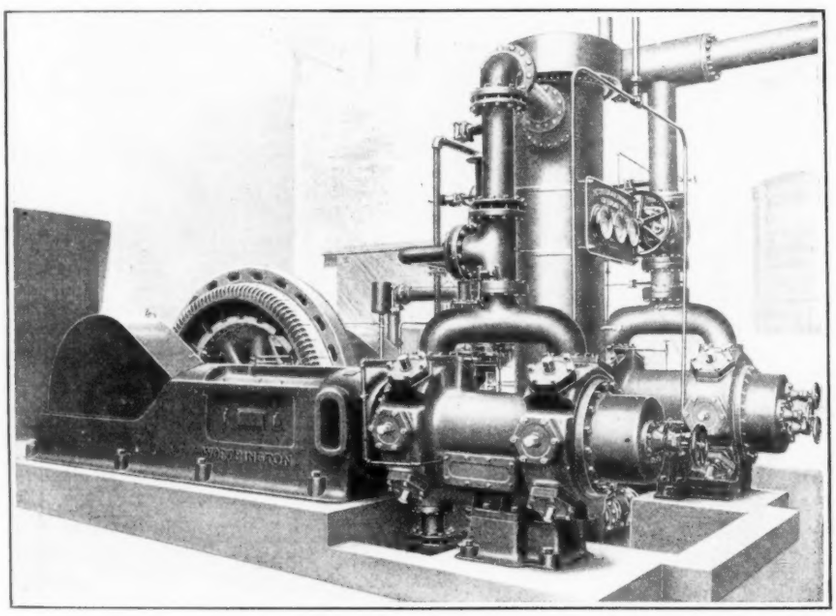


Fig. 4—A Worthington compressor in a Los Angeles, Calif., plant

The gas is now led to a shell-and-tube condenser unit, used as a gas cooler, where the gas is cooled down to a temperature in the neighborhood of 95 deg. F. by cooling water, branched from the condenser units. From here it is led back to one of three accumulator units through

REFRIGERATION *for the Engineer*

which all the liquid ammonia used is made to traverse an internal coil, this coil being immersed for half its depth in liquid ammonia in the shell, and, being under a pressure of about 38 lb. gage, the ammonia boils at a temperature around 24 deg. F.

As the upper portion of the coil is exposed to gas entering the shell at around 95 deg. F. temperature, this gas is met, on entering the elbow at the side of the shell, by a spray of liquid ammonia from an expansion valve in the elbow, its supply of liquid being taken from the sub-cooled liquid line. The gas now mingles with the vapor from the boiling ammonia and reaches the high-pressure cylinder at a temperature of about 50 deg. F. Here it is compressed to a pressure of about 140 lb. gage in summer and about 90 lb. in winter. The cooled liquid ammonia goes to the brine coolers at a temperature around 25 deg. F.

The machine is driven by a 600-hp. synchronous motor at 165 revolutions.

Fig. 4 shows a Worthington 700-ton two-stage feather-valve compressor installed at the Los Angeles Ice & Cold Storage Co. The shell-and-tube type water intercooler is shown erected between the cylinders. The valve consists of a top and bottom grid with the feather strips sandwiched between. The bars of one grid cover the slots or opening in the other grid, and these covering bars are milled so that they are slightly arched in the center of their length. This allows the feather strip to lift or spring up in the center of its length when pressure is applied through the slot which the feather covers. This action allows the gas to pass around the sides of the strip and cut through the upper slots on each side of the strip. The ends of the strip do not lift, as the milling at the ends of the covering bars is just shallow enough not to pinch the ends of the strips, but allow them to move when the center springs up.

The stuffing box, or gland, is fitted with a full metallic inner packing bolted securely in place. There is next to this a smaller stuffing box or gland containing semi-metallic packing adjusted by a gland nut and fully lubricated from a force-feed lubricator.

Fig. 5 shows a view of the De La Vergne compound compressors at the Fulton Ice Co., New York City. These machines have low-pressure cylinders 18 in. in diameter, and 12-in. diameter high-pressure cylinder, the stroke being 12 in. They are direct-connected to synchronous motors operating at 115 r.p.m. The water intercooler is above the cylinders.

Suction pressure at the Fulton plant is 19 lb. gage with a suction temperature of 21 deg. F. The gas leaves the low-pressure discharge at 69 lb. and a temperature of 143 deg. F., and is cooled to 85 deg. F. before entering high-pressure suction. It leaves the high-pressure discharge at a pressure of 135 lb. gage at a temperature of 186 deg. F. The cooling water goes to the condenser at 55 deg. F. and leaves at 74 deg. F. The liquid ammonia leaves the condenser at 75 deg. F., 55 gal. of water being used per minute.

An unusual feature of this machine is a supplementary suction port similar in detail to the exhaust port on a uniflow engine. The piston uncovers this center port at the ends of the suction stroke, and this permits suction gas to enter the cylinder and thus make up for any deficiency caused by wiredrawing through the regular suction valves. This center port can be made separate from the suction passages so it may be utilized for a two-suction pressure purpose, such as the forecooling of

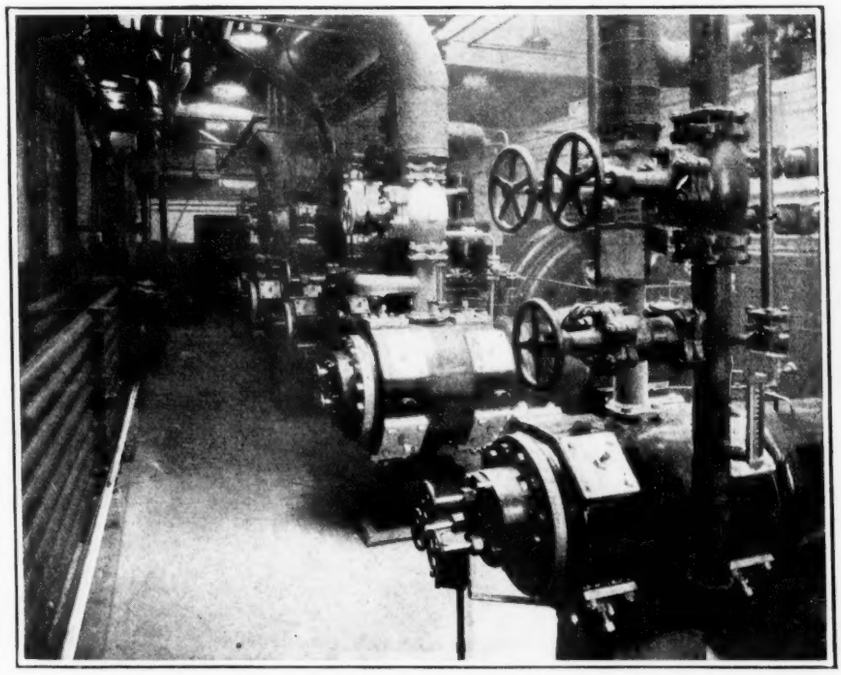


Fig. 5—De La Vergne clearance pocket compound compressors, Fulton Ice Co.'s plant, New York City

can water in an ice plant or the high brine of a warehouse. The suction of the higher pressure is, in this plan, admitted at the end of the stroke and compresses the gas already in the cylinder up to the second suction pressure before the piston starts on the compression stroke. Considerable economy may be effected in this way.

With regard to temperatures and pressures to be expected in the operation of compound machines, no set rule can be applied because of many factors that would influence results. Re-expansion of the gas in clearance spaces and pockets, heating of the clearance-pocket gas entering the cylinder during this re-expansion, and the heat taken up by the entering gas from the warm cylinder walls, all influence operating conditions.

When starting a compound compressor, the discharge and suction stop valves should be kept closed, and the

REFRIGERATION *for the Engineer*

bypass valves in both cylinders opened. After turning on the cooling water, start the compressor and slowly bring it up to speed. Open the discharge stop valve and at the same time close the high-pressure bypass. Next close the low-pressure bypass and then open the suction stop valve very slowly. Do not open the suction stop valve quickly, especially if the machine has been shut down for a long time, without having the expansion coils and suction line pumped out. If the discharge valves work noisily, liquid is probably coming in with the gas and the suction valve should be closed. Then open slowly and give the liquid time to evaporate before opening the valve wider.

A thermometer on the suction line is of vital importance, as it quickly shows if power is being wasted. If the thermometer shows the temperature under that which corresponds to the suction pressure in the ammonia tables, the gas is coming back wet. The expansion valves should be so regulated that the thermometer will show the gas at the temperature indicated in the tables or a few degrees superheat. Suppose the gas is coming back zero and the gage pressure is 15 lb. From the ammonia tables one will find that at 15 lb. the gas should show —1 deg. F., so the gas is superheated one degree.

Clearance space must be added simultaneously to the high- and low-pressure cylinders to maintain an equal load balance between the cylinders. If the suction pressure is lowered, the intercooler pressure is also lowered and consequently the work in the high-pressure cylinder is increased. Overloading the high-pressure cylinder is then avoided by opening one or both of its clearance pockets.

If the suction pressure is increased, the intercooler pressure goes up and consequently the work in the low-pressure cylinder is increased. Overloading the low-pressure cylinder is then prevented by opening one or both of its clearance pockets.

Owing to the fact that there are so many different pressure conditions under which these machines may operate, it is impossible to give specific instructions here for clearance-valve regulation, but the engineer will soon learn from experience the best operating procedure.

Savings in a Refrigerating Plant by Eliminating Small Losses

By Edgar J. Kates*

IN A refrigerating plant, as in all other industries, there are numerous small leaks that could be avoided. Failure on the part of the operating engineer to remedy such defects causes financial losses equal to a substantial profit on the plant's output.

About twelve years ago an oil-engine driven ice plant of 45 tons daily capacity was built, using the center-freeze plate system. The freezing tank is divided into six 15-ton compartments, each compartment containing several freezing grids. Water sufficiently pure for the condensers and for the engine jackets is pumped from wells, but the water for freezing is purchased from the city water supply.

Although a fairly complete log had been kept of the various details of plant performance, it was not until a year ago that the quantity of city water metered was compared with the amount of ice produced. Theoretically, a ton of ice is equivalent to 32 cu.ft. of water. Making an allowance of 25 per cent for unavoidable wastage, it should be possible to produce a ton of ice from 40 cu.ft. of water. To our amazement the plant was using almost 100 cu.ft. Evidently, then, about 2½ times as much water was being consumed as was necessary.

Upon investigation, several avenues of water loss were found. City water was being used on the ice platform for washing out the floors of the trucks, whereas well water would have been just as good. Frequently, after the ice plates were pulled from the freezing tanks, the remaining water, approximately equal in amount to that frozen, was drained to waste, in the belief that this was necessary to obtain clear ice. This practice involved not only a waste of water, but also a loss of the refrigerating work represented by the chilled water. It was also found that before starting the oil engines, it was the practice to run a full stream of city water through the jackets for periods as long as one-half hour.

Once attention had been called to these matters, they were easily rectified. An unused tank on the roof was piped to receive well water from the general pumping system and to deliver it to the ice platform. The freezing tanks were provided with skimmers and were drained less frequently, without detracting in any way from the high quality of the ice produced. The water was fed to the engine jackets only a short time before the engines were started, and at but a small rate of flow.

The results are shown by the record for 1927 for the period of four months from April to July, compared to records of the previous year. The water consumption averaged 40.4 cu.ft. per ton, which is within 1 per cent of the standard that had been set.

CITY WATER CONSUMPTION

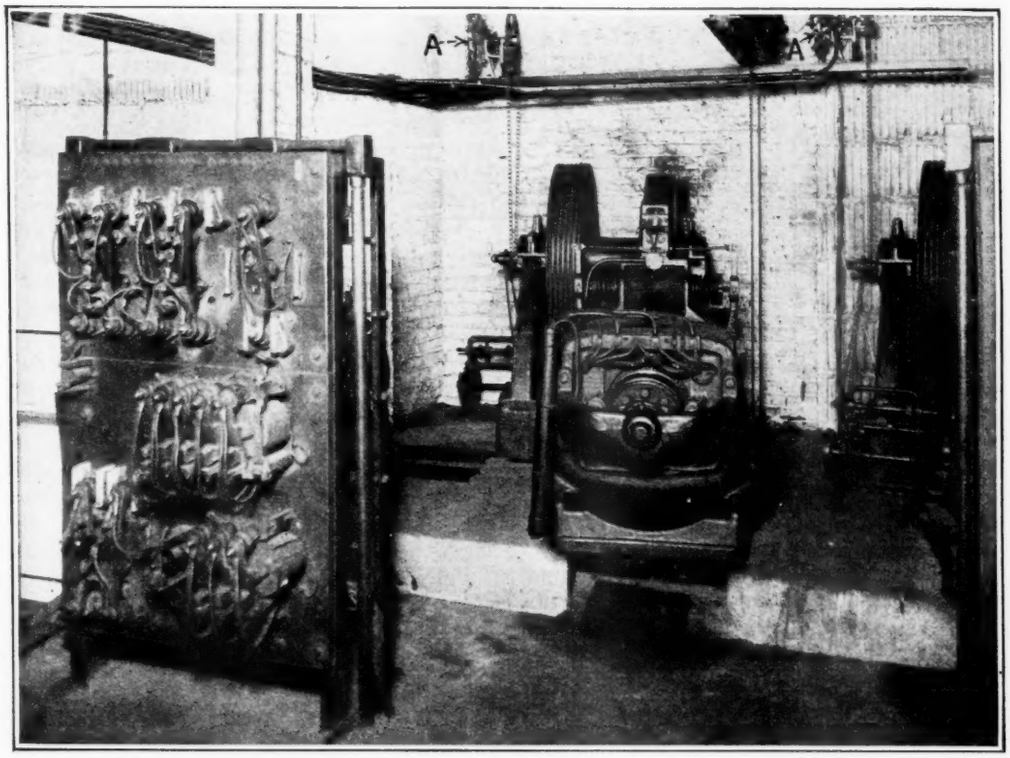
Period Covered	Tons of Ice Produced	Cu.Ft. City Water Metered	Cu.Ft. City Water per Ton of Ice
1026 (prior to investigation)			
4 months, April to July.....	2,595	258,331	99.5
12 months, Jan. to Dec.....	6,060	595,555	98.3
1927 (subsequent to investigation)			
4 months, April to July	2,415	97,505	40.4

The saving over 1926 was 59 cu.ft. per ton of ice. The annual saving on an ice production of 6,000 tons will be 354,000 cu.ft., and on an output of 9,000 tons, which is the normal volume of sales of a 45-ton plant, the water saving would be 531,000 cu.ft. At a water cost of 12 cents per 100 cu.ft., the annual saving is over $600, obtained at practically no cost.

This is only a small plant, and a $600 saving is quite an item. A proportional saving could just as well have been made in a 200-ton plant and would have amounted to more than $2,500 per year, quite a saving in a minor item of expense that is often disregarded. Engineering study of plant records often pays well.

*Consulting engineer, New York City.

ELECTRICAL
Operation and Maintenance



Electric-Elevator Signals

How Systems with Relay-Type Push Buttons Operate*

By F. A. Annett
Power, Editorial Staff

ALL elevators should have a signal system of some kind. The type best suited to the conditions will be controlled by a number of factors, such as the number of cars in a group, the kind of service, the purpose for which they are used and the car speed. In general the system should have at least an automatic reset, so that the operator cannot restore the signals without bringing the car to the floor from which the signal was given. Automatic resetting of the signals leaves the operator free to manipulate the car and handle the car gate and landing doors.

Although drop-type annunciators, as described in the previous article,[1] are used extensively in elevator signal systems, they do not possess all the characteristics to make them well adapted to modern systems. Lamp indicators in various forms have come into use. Modern designs of these indicators occupy less space for the same number of floors than the drop type and, when the lights flash on, attract the eye to a greater degree than any of the drop methods.

With a lamp annunciator some method must be provided to hold the lamp circuits closed, after the floor buttons have been pushed, until the call has been answered and the signal reset. This can be done in two

*All rights reserved.

[1] "How Push-Button Annunciator System Operates," Aug. 30.

ELECTRICAL *Operation and Maintenance*

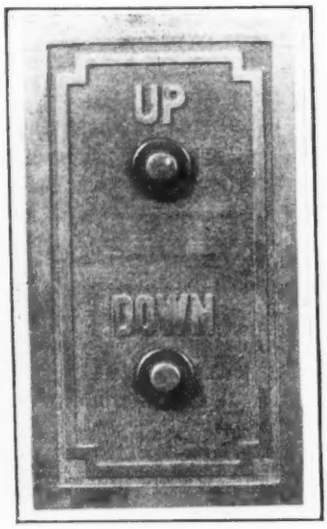


Fig. 1—Front view of relay-type push button

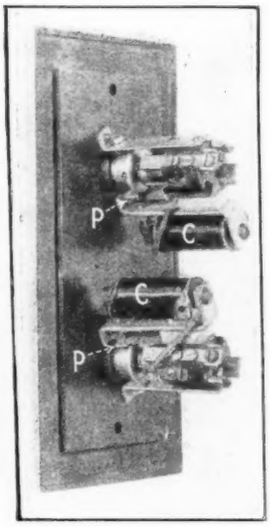


Fig. 2—Rear of push button Fig. 1

ways. One method uses a relay-type push button, which when pushed, remains closed and completes the indicator-lamp circuit until released by the reset coils located in the push buttons. In the other method the push button, when closed, energizes a relay, the contacts of which light the indicator lamp. With this system the relays are arranged in a central group, which is generally located in the penthouse, and there must be provided a relay for each up or down signal; that is, if there are 10 floors there will be 18 relays. When the indicating-lamp circuit is closed through a relay's contacts, it remains closed until the relay is reset by the reset device.

System's Operation Explained

Fig. 4 is a wiring diagram of a Holtzer Cabot Electric Company's system using the former principle. The reset coils in this system are mounted with the push buttons, as shown at *C* in Fig. 2. One of the two reset coils is for the up-direction signal and the other for the down. On each push button there are three contacts, one for the buzzer circuit, one for the signal-lamp circuit and one for the reset coil. The operation of the buttons will be understood from 4 *A* and 4 *B*, at the bottom of Fig. 4. When a button is pressed, a pawl *P*, Fig. 2, drops in back of a collar on the button and prevents the drop and reset contacts from opening as indicated by the position of the up button, 4 *B*. This retains the lamp contact closed until the reset coil *C* is energized and pulls pawl *P* clear of the button, which allows it to return to the normal position as shown in 4 *A*.

The buzzer circuit is closed only as long as the push button is held all the way in. As soon as the button is released, it returns far enough toward its normal position to open the buzzer contacts without opening the light or reset contacts. This is the position of the up button in 4 *B*. Every time the button is pressed to the full-on position, the buzzer will ring.

Assume that, in Fig. 4, the third-floor down button is pressed to the full-on position. Then contacts *A*, *B* and *C* will be closed. These close a circuit from the + side of the power supply to the connection box in the hoistway and to the third-floor down push button. From the push button one circuit is through contact *A*, into wire *D* and through lamp 3 of the down bank in the annunciator and to the — side of the power source. Making this circuit alive lights lamp 3, which shows the location of the call. Contact *B* is connected to reset coil *E*, the circuit for which is open at reset bottom *G* on the annunciator in the car.

As long as contact *C* of the landing button is closed, a circuit is made through the buzzer to the — side of the power supply. The sound of the buzzer attracts the operator's attention to the call. As previously explained, the buzzer contact remains closed only as long as the push button is held in the full-on position. As soon as the one making the call releases the button, contact *C* opens and the buzzer stops sounding. Closing push button *G* on the annunciator completes a circuit for reset coil *E*, from *B* through this coil, push button *G*, and to the — side of the line. Energizing coil *E* causes it to pull the pawl away from the push button and allows the button to return to the normal open position as shown in the figure, and the third-floor down light on the annunciator goes dark.

It can be seen from Fig. 4 that all the down reset coils are connected to the same wire, so that when reset button *G* is closed, all the down reset coils are energized and any of the down push buttons that are closed will be released. Similar operations apply to the up buttons as have been explained for the down, except that the up lamps light on the annunciator instead of the down.

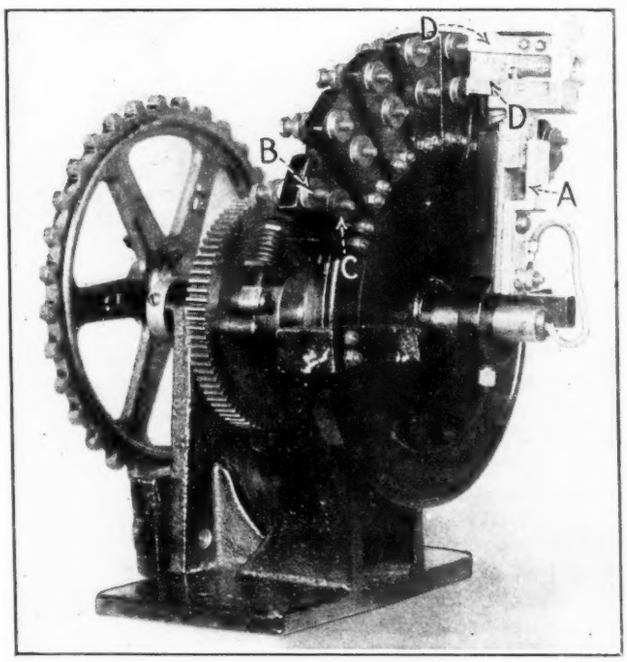


Fig. 3—Automatic reset machine

ELECTRICAL *Operation and Maintenance*

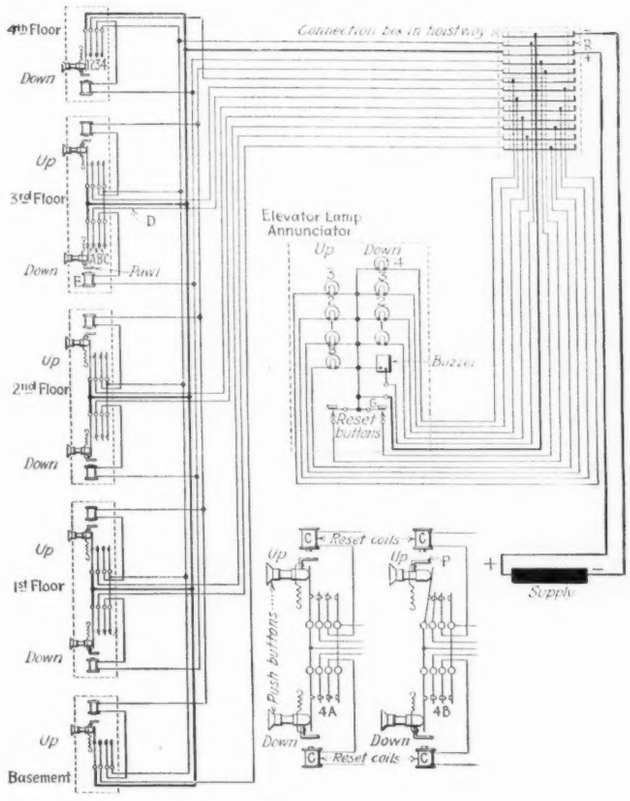
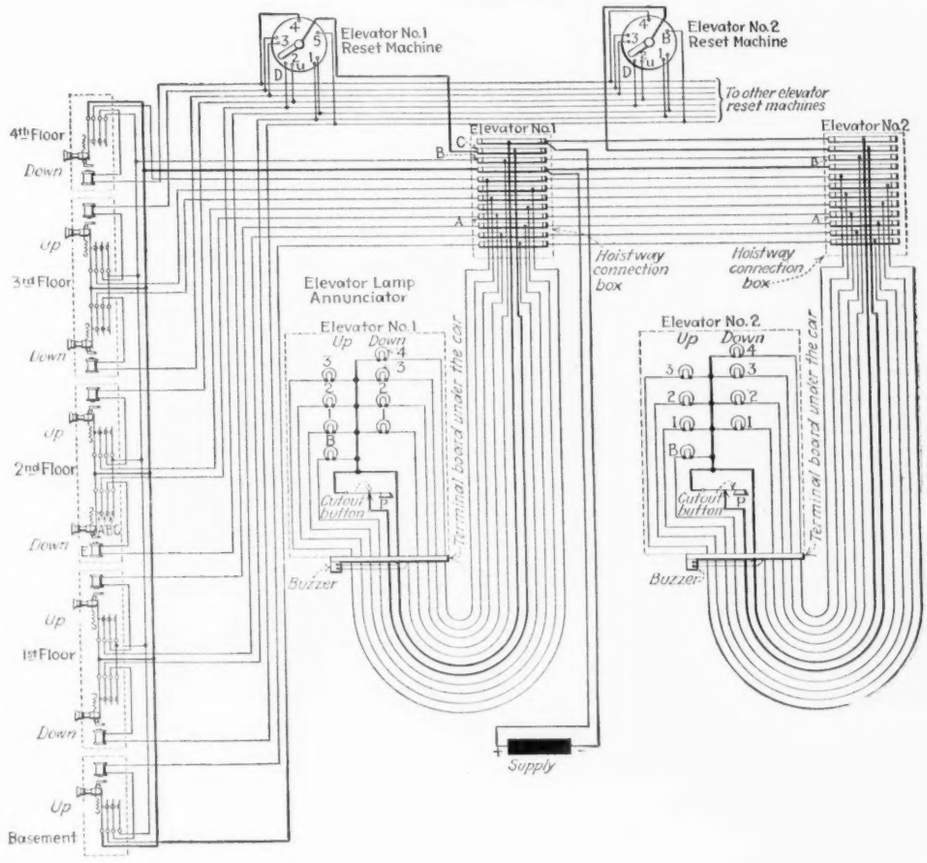


Fig. 4 (Above) — Wiring diagram for signal system without automatic reset

Fig. 5 (Right) — Wiring diagram of signal system with automatic reset machine



To apply this equipment to two elevators, each machine is wired to its junction box in the hoistway similar to that shown in Fig. 4. Then it is only a matter of connecting the two boxes in parallel; that is the — terminal of one box is connected to the — terminal of the other, *R* of one to *R* of the other, etc. Only one machine junction box is wired to the floor push buttons, as only one set of these is used for a bank of elevators.

Although this system is simple in its operation, it lacks the individual reset feature which clears the call on the annunciator when it has been answered. This feature can be obtained by a reset equipment, Fig. 3, driven from the elevator machine. The reset machines are shown at *A* in the headpiece, and are driven from the traction-sheave shaft by sprockets and chain. A wiring diagram similar to Fig. 4, but with automatic reset, is shown in Fig. 5. On this diagram if any of the floor buttons are pressed, they will close circuits similar to those in Fig. 4, light the annunciator lamps and sound the buzzer. For example, if the down button on the second floor is pressed, circuits will be energized as explained in Fig. 4.

The reset machine, Fig. 3, is a dial switch geared to the elevator machine by a reduction gearing and chain drive that allow the switch arm *A* to make, on high-rise machines, approximately one revolution when the car travels the length of the hoistway. On low-rise machines the contact arm makes less than one-half revolution, as does the machine in the figure. There are two sets of contacts, *B* and *C*, on this switch, one for the up reset and one for the down. The arm carries two contacts, *D* and *D*, only one of which rests on the stationary contacts at a time. The two contacts on the arm are pivoted in such a way that when the arm is moving in the up direction the up contact is in service. When the car's direction is down, the other contact completes the down reset circuits, and the up contacts do not close. This is necessary, since with the car in the up motion only the up calls are answered and only these should be reset when answered. Likewise, on the down motion only the down calls are answered and only these should be removed from the annunciator when answered. On traction ma-

ELECTRICAL *Operation and Maintenance*

chines, slipping of the cables on the driving sheave tends to throw the reset machine out of the correct relation to the landings. To overcome this difficulty, at the limit of travel if the arm is out of adjustment it strikes a stop and a clutch in the drives slips to bring the contact arm into the correct position.

Assume that the second-floor down button is pressed, Fig. 5. This will close push-button contacts *A* and *B* until the call is reset, and contact *C* as long as the one making the call holds the button in the full-on position as previously explained. Contact *C*, when closed, completes a circuit from the + side of the power source, to the connection board in the hoistway, through contacts *A*, *B* and *C* of the second-floor down button and returns to terminal *B* in the hoistway connection boxes. From these boxes circuits go to each car, through the buzzer and returns to the connection boxes in the hoistway and to the — side of the power source. In this particular installation the annunciator is wired to a terminal board under the car, where the buzzer is also located.

The second-floor down-landing lamp circuit is through contact *A*, on the push button to *A* terminal in the hoistway connection boxes. From *A* in each hoistway connection box there is a circuit to each car, through down lamp No. 2 and returns to the — side of the power source. This operation lights the second-floor down lamp on each car and indicates to the operators the floor where the call is made.

If No. 1 car is coming down, when it reaches the second floor the operator should stop and answer the call. With the car in the down motion the contact arm of No. 1 reset machine is moved until it rests on contact 2 *D*, about the time the car reaches the second floor. With the arm of No. 1 elevator reset machine on contact 2 *D*, a circuit is completed through contact *B* on the second-floor down button, reset coil *E* and to contact 2 *D* of the reset machines. If the arm of machine No. 1 is resting on this contact, the circuit is completed through the arm to terminal *C* in the hoistway connection box. From this terminal there is a circuit to push button *P* in No. 1 car back to the connection boxes in the hoistway and to the — side of the power source. Completing this circuit energizes the second-floor down reset coil *E* and causes it to release its push button, and the down No. 2 lamp on each annunciator goes dark, indicating that the call has been answered. What has been said regarding the second-floor down button applies to any of the other call buttons.

Cutout button *P* can be used by the operator to prevent the reset machine from removing the signal from the system. For example, assume No. 1 car coming down and on leaving the third floor it had a full load of passengers. When the car passes the second floor, the reset machine will clear the down signal for this floor. To prevent this the operator holds button *P* open, which breaks the reset circuit and prevents the second-floor down signal being cleared. The signal remaining on No. 2 annunciator shows the operator that the second-floor down call has not been answered.

In a high building the conventional type of signal-light annunciator becomes unwieldy in length, particularly if the signals are arranged in an up and a down row. To provide an annunciator that is compact, the Holtzer

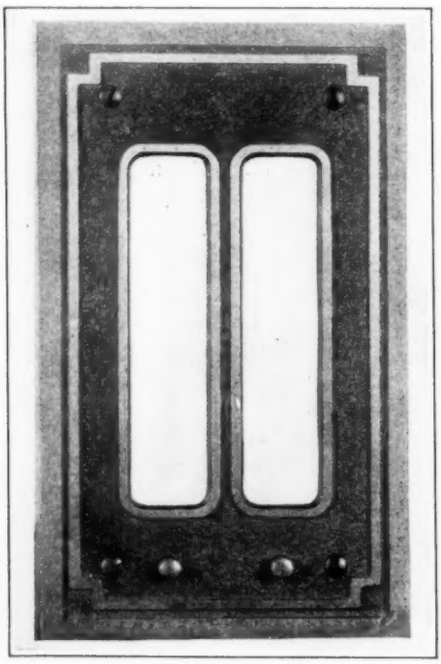
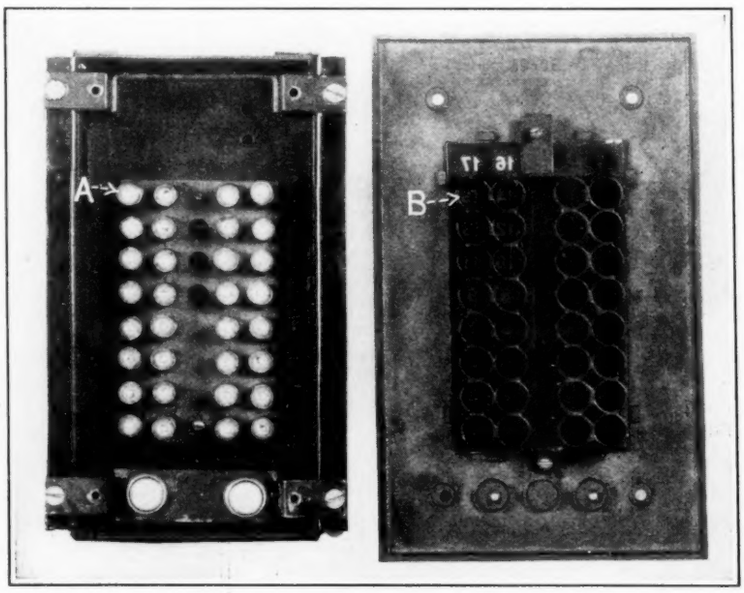


Fig. 6—Front view of lamp annunciator



Figs. 7 and 8—Inside of annunciator, Fig. 6, showing the signal lamps and their cells

ELECTRICAL *Operation and Maintenance*

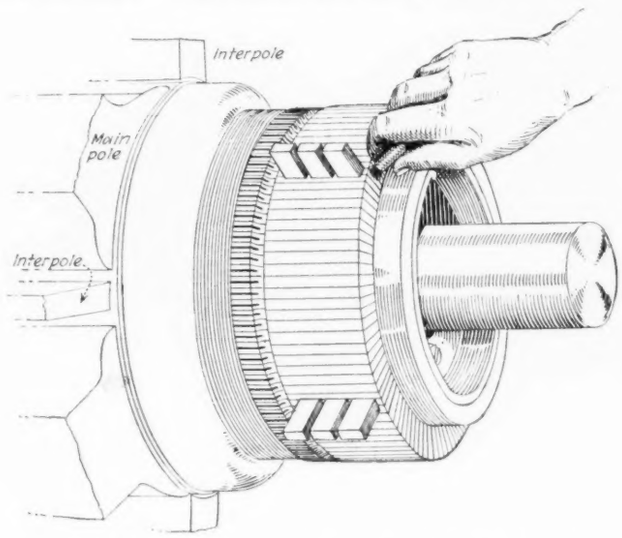
Cabot Electric Co. has developed one in which the floor numbers are back of a special glass and are caused to become visible by lighting a small lamp, back of each number. A front and an internal view of one of these annunciators is shown in Figs. 6, 7 and 8. The front of the annunciator, Fig. 6, has dimensions of 5x9 in. and on an exposed glass surface 1x5 in. the signals for 16 floors are given for one direction. The lights shown at *A*, Fig. 7, are inclosed, back of the floor numbers in round cells, as at *B*, Fig. 8. The floor numbers in the light cells can be seen on the left in Fig. 8. This system is designed to operate on 12 to 14 volts direct or alternating current.

In the next article a system with relay signal and reset coils installed at the elevator machine will be described.

How the Motor Trouble Was Located

By J. Elmer Housley

DIRECT CURRENT offers many puzzling problems in the operation of motors. In one case the trouble was so slight that it was almost corrected without locating the cause. The trouble was finally found to be due



The end of a piece of lamp cord held against the commutator to locate the neutral position

to a reversed series-field winding on a 10-hp. compound-wound interpole motor driving a pressure oil pump. The trouble consisted of occasional low pressure on the oil system and heating of the motor's commutator. The commutator of this motor would get rough, while that on a duplicate motor did not.

One repair man made a few tests and moved the brushes and brush arm off the marked neutral position, without rechecking the commutator's operation. This procedure apparently remedied the situation as far as the repairman was immediately concerned, for the sparking diminished at the commutator and the speed of the motor increased and no more complaint was made regarding oil pressure. However, it was not long until complaint was made by the operators that the brushes were not lasting long, the slots in the commutator seemed to be hard to keep clean, the commutator would not take a polish and it had to be cleaned frequently or the sparking would reach serious proportions.

The unit had been completely overhauled about one year previously. After the machine was put back in service, it did not operate properly. The fact that the commutator, when a piece of lamp cord fanned out and held against its end, while running showed no sparking at a point beyond the brush, was evidence that the electrical circuit was not correct. As shifting the brushes changed the speed, it was suspected that the field circuit was involved. It was assumed that the interpole winding polarity was correct or the commutator would spark badly. The shunt field was checked with an ammeter in the circuit and the amperage indicated full field and each field coil heated evenly. By deduction the series field was left as the offender. The simplest test was to reverse the terminals of the series winding. This was done, the brush yoke was set on the factory neutral mark and the motor started up. The speed checked O.K. and commutation was black. Operation since that time has proved that the diagnosis was correct.

It might be of interest to add that a simple way to check the brush position is to hold the end of a piece of flexible lamp cord against the end of the commutator at the brush position while the machine is running, as indicated in the figure. If no sparking is obtained at the end of the wires, it is an indication that the brushes are on the neutral position. It will be advisable to move the wire around the commutator a short distance either side of the brush position to see if a light sparking is obtained. The absence of sparking on one side of the brush position would indicate that the brushes were off the neutral position. Before making this test, the free end of the wire should be carefully insulated so that there will be no danger of causing a short-circuit or ground.

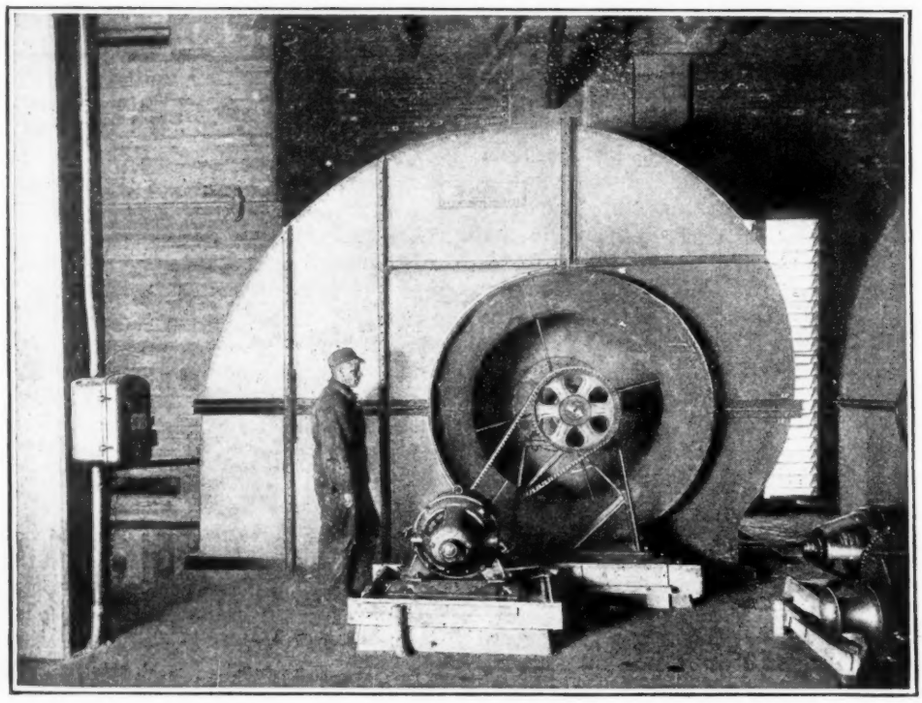
What Made the Motor Howl?

I AGREE with J. F. Lincoln's opinion, page 965, June 21 issue, that it was not the insulating of the induction-motor rotor bars, as supposed by C. Dickerson, but the resoldering of their end connections, that was responsible for stopping the howling noise produced by the machine.

One of my 15-hp. squirrel-cage motors began to howl the day it was put in service. At first it was thought that perhaps loose laminations were responsible for the trouble. The motor was operating satisfactory without overheating and responded quickly to any variation in the load. But when it was opened, an inspection revealed that several bars were loose in the end connecting ring. They were resoldered, and since then the motor has been operating quietly.

All my squirrel-cage motors are made by one of the best English firms and are without insulation on the rotor bars.

F. C. Bulsara,
Nagpur, India. The Model Mills, Nagpur, Ltd.



Ventilation of the Holland Tunnels

Nearly Four Million Cubic Feet of Air per Minute Required To Ventilate New York-New Jersey Vehicular Tunnels

AFTER two years of preparatory research and design, and seven years of actual field work, the Holland Vehicular Tunnels will be opened to the public on November 13, 1927. These tunnels under the Hudson River are expected to relieve materially the present traffic-congested ferries now operating across the Hudson River. It is estimated that the roadways in the north and south tunnels will each permit the passage of 1,900 vehicles an hour. The average ferry line, if operated on a ten-minute schedule, can transport one way approximately only 320 cars an hour, about one-sixth the capacity of the tunnels.

The tunnels extend from the neighborhood of Varick and Canal Streets, Manhattan, to Provost and Twelfth Streets in Jersey City. The length of the under-river portion of each tunnel is about 5,480 ft. and the total length is 9,250 ft. Throughout the greater portion of their length the tubes are 29 ft. 6 in. in diameter and are divided into three sections, as shown in Fig. 1. The center portion, occupied by a 20-ft. roadway, is 13 ft. 6 in. high and affords sufficient headroom for large trucks. In the upper and lower sections are exhaust and fresh air ducts that carry the air for ventilating the tunnel.

In constructing the tunnels 500,000 cu.yd. of dirt and silt were excavated. The tunnel linings required 115,000 tons of cast iron. The concrete mixed and poured amounted to 130,000 cu.yd. These construction data may serve to indicate something of the size of the project that cost the States of New York and New Jersey more than 47 million dollars to complete.

One of the first and most important problems that confronted the engineers was the provision of ventilating equipment sufficient to remove the exhaust gas from the automobile engines. Practically no information was available regarding the quantity, composition and physiological effect of these gases, and before the design of the tunnels could be completed it was necessary to carry out research work to obtain this information.

From these tests it was determined that the only dangerous gas given off by motor vehicles was carbon monoxide, although the smoke from improper combustion is irritating to the eyes of most people. The quantity of carbon monoxide in cubic feet per car per minute was found to vary between 0.57 and 2.80 at normal car speeds. It was also learned that concentrations of 4 parts of carbon monoxide in 10,000 parts of air, when breathed for one hour, cause no ill effects or discomfort, while 6 parts are slightly noticeable, and 8 to 10 parts have a marked effect.

In order to obtain the desired dilution of 4 parts in 10,000, it is necessary to provide means for supplying 1,919,982 cu.ft. per min. of fresh air to the north tunnel and 1,841,456 cu.ft. per min. to the south tunnel. The total volume of air to be supplied to both tunnels per minute is approximately equal to the volume of air contained in a 40-story skyscraper 100 ft. square. If an

attempt were made to ventilate the tunnels with this amount of air by blowing it in at one end and out the other, a mile-a-minute gale would be produced along the

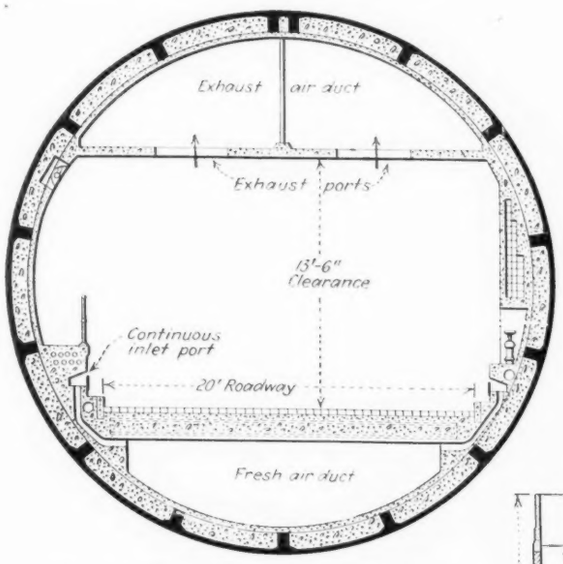


Fig. 1—Cross-section of one tunnel

tunnel roadway. This quantity of fresh air will change the air in the tunnels about 42 times an hour.

The equipment necessary for handling this huge volume is installed in four buildings, two at the pierheads and two inland. The inland buildings house the fans for ventilating the adjoining portal sections, the whole intermediate section to the pierhead building in the tunnel, where the traffic is down grade, and half the intermediate section, where the traffic is upgrade. The fans in the pierhead buildings ventilate the under-river sections and the upgrade half of the intermediate sections.

A total of 84 fans are installed that range in capacity from 81,000 to 227,000 cu.ft. per min. and operate against static heads of from 0.6 to 3.75 in. of water. They are divided into 14 sets of blowers and 14 sets of exhaust fans, each set comprising three fans. Two fans operating in each set will supply the maximum quantity of air required, so that should two fans in any one set fail at the same time, the remaining fan would have capacity enough to furnish a little over half the required supply. A typical arrangement of the fans is shown in Fig. 2.

The fans are all of the backward curve blade type which permits parallel operation and prevents possible overloading of the motor drives. The motors are of the wound-rotor type and chain-connected to the fans. Fresh air from the ventilating buildings is blown into the duct under the roadway shown in the cross-section, Fig. 1. At intervals of 10 to 15 ft. the air is fed through flues to continuous expansion chambers on both sides of the roadway above the curbing. From these chambers the air enters the tunnel through continuous slots that may be varied in width from $\frac{3}{4}$ to $1\frac{3}{4}$ in. by adjusting copper-steel plates that form the sides of the chambers. The contaminated air is drawn off to the exhaust air duct above the roadway through ports located every 10 to 15 ft. along the length of the tunnel. These openings, that are from 3 to 6 ft. long, are provided with dampers for making local adjustments. With this method of ventilation there will be no longitudinal air movement except as caused by the moving traffic.

A total of 6,000 hp. is installed for driving the fans, of which two-thirds will be in use during times of maximum demand. It is obvious that extreme precautions had to be made to insure at all times a continuous supply of electric energy to meet this load. Through the co-operation of the United Electric Light & Power Co. and the New Jersey Public Service Corp. the busbars of each ventilating building are supplied with energy through three cables from the New York side and three cables from the New Jersey side. Interconnections at the busbars that make it possible to connect any or all of the motors to any of the six cables, each of which has

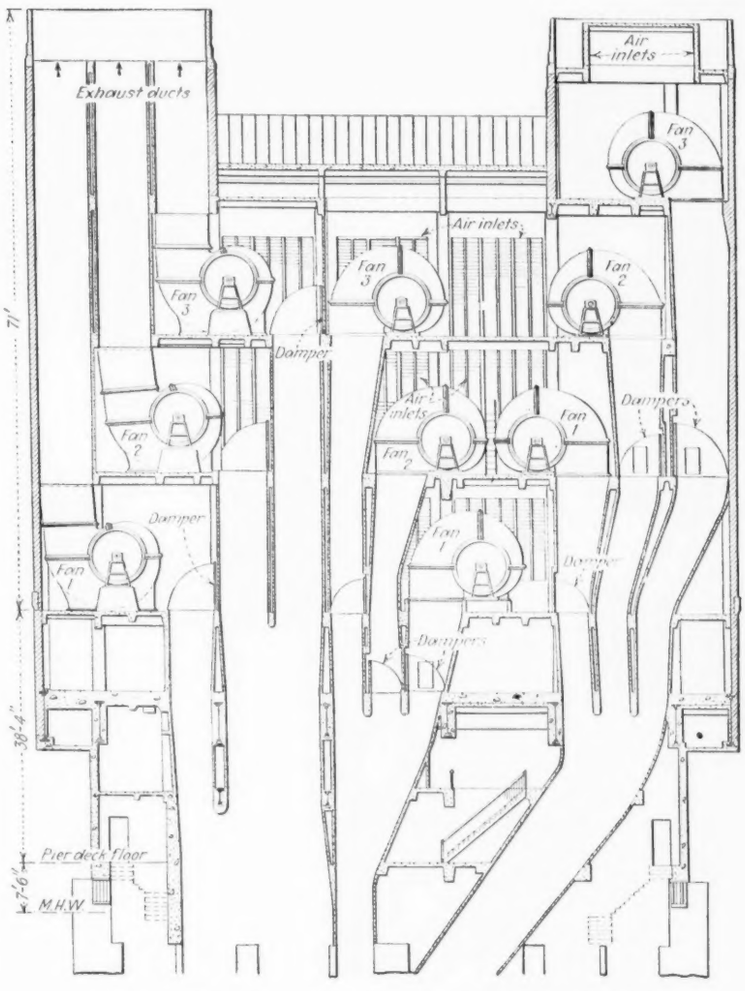


Fig. 2—Typical section through ventilating building

a capacity to supply the maximum tunnel load. As the cables coming from each side of the river receive energy from at least two independent sources, a continuous power service is further assured.

In each exhaust duct are installed automatic carbon monoxide recorders that serve to indicate whether the fresh-air supply meets the requiremnts of the varied traffic conditions. The continuous analysis obtained by these instruments is recorded graphically on charts in the control room of the administration building, from where the operator can increase or decrease the fresh-air supply as indicated by the record of carbon monoxide.

Red and green lights are provided in the tunnel for traffic regulation, and in addition a special emergency signal is provided which, when illuminated, bears the words "Stop Engine" and serves notice to the drivers of vehicles that their motors should be shut down.

An organization of about 400 men will be needed to operate and maintain the tunnels. It is estimated that a force of 60 men will be required to operate the ventilating equipment and another crew of 60 men for its maintenance. About 200 police will be necessary to regulate traffic and for general police duties. The remainder of the organization will be made up of administration and toll collectors.

Answers to What Do You Know

The questions are on page 659

Ans. 1—Such valves have neither steam nor exhaust laps.

Ans. 2—Not enough air is trapped in the pot to cushion the dash as it drops.

Ans. 3—No, for the speed of the poppet valve must be checked by the cam just before the valve seats. As a result, there is some wiredrawing. On the other hand, the Corliss valve wipes past the steam engine at some velocity, giving a sharp cutoff.

Ans. 4—The rivets are exposed to the fire, and if the head is set concave the entire rivet with its head is removed from the possibility of being cooled by the water in the boiler.

Ans. 5—No. The crankpin can be taken as a cantilever supported by the crank arm, so that the bending moment produced by the pressure has a lever arm equal to one-half the crankpin length. The bending moment in the shaft has a lever arm equal to one-half the pin length plus the thickness of the crank arm. The shaft must then be greater in diameter to resist the greater bending moment.

Ans. 6—Yes.

Ans. 7—If he did this the total force, due to the steam pressure, tending to drive the wheels around would be greater than the adhesive force due to the locomotive weight, which tends to prevent slipping. By throttling the steam a balance is established.

Ans. 8—A Bilgrim diagram is a graphical analysis of a steam-engine valve gearing, whereby with one or more factors given the dimensions of the valve may be determined.

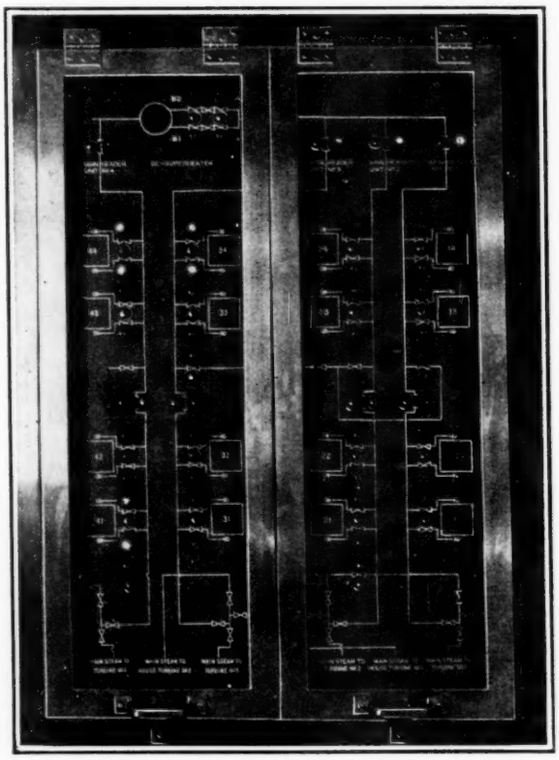
Ans. 9—Charles B. Richards.

Ans. 10—The automatic-landing machine will, when the car switch is centered after passing a floor, stop the car level at the next landing, automatically, but if for any reason the car is not level with the floor, the machine will not correct the leveling. With the automatic-leveling type machine the car is not only stopped level with the landing floors, but is maintained level, automatically.

Control Panel for Motor-Operated Valves

IN LARGE generating plants where the main steam valves are motor operated, it is customary to provide a remotely located emergency control board from which all the valves may be closed. The boards are usually quite large, often being 6 ft. high and 5 to 8 ft. long, the length depending on the number of motor-operated valves installed.

The illustration shows the emergency valve control board installed in a large plant and indicates what can be done toward reducing the control board size. The board is recessed in the brick wall of the boiler control room and has glass front doors that tend to prevent its use except in case of emergency. The panel is made of $\frac{1}{4}$-in. steel plate finished in dull black. On it is engraved and enameled in white the main steam piping diagram, which shows the location of the valves controlled. The numbered squares on the diagram indicate the location of the boilers.



Emergency control panel for motor-operated valves

From this board the valves may be closed only, the opening operation being accomplished by local control installed near the valve it operates. Closed valves are indicated by green lights that go out when the valve is opened. It should be noted that the control for the two boiler stop valves is arranged so that one push button will close both valves.

The electric wiring for push buttons and lights is contained in a steel cabinet in the brick wall and is easily accessible by opening doors on the opposite side of the wall to the switchboard panel.

Charts for Finding Heat Losses in Flue Gas

By Mark Buskaveta

IN ORDER to facilitate the computation of boiler heat balances where such balances are made daily, and as a matter of comparison, the accompanying curves were designed.

Fig. 1 gives the loss in B.t.u. per pound of fuel consumed due to the temperature of the flue gas. To read the curve, find the point on the bottom scale corresponding to the weight of flue gas per pound of fuel consumed, follow the line diagonally until it intersects with the temperature line corresponding to the temperature of the flue gas minus the temperature of the boiler room. Then follow the vertical line to the top scale and read the loss in B.t.u. per pound of fuel consumed.

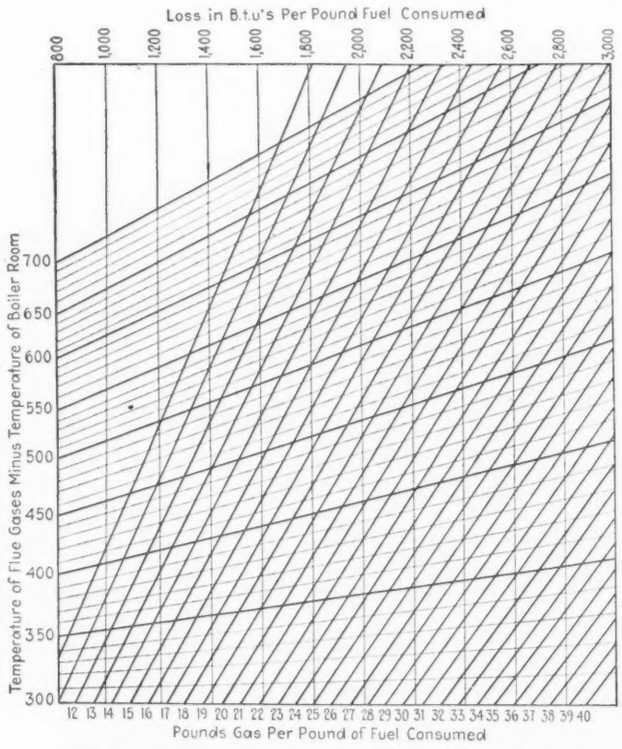


Fig. 1—Chart for finding the heat loss in dry flue gas

Given the following data: Weight of gases per pound of fuel, 18 lb.; temperature of flue gases, 600 deg. F.; temperature of boiler room, 70 deg. F. Find the loss in B.t.u. per pound of fuel consumed due to the temperature of the flue gas.

On the bottom scale of Fig. 1 find the line corresponding to 18 lb. of air per pound of fuel consumed, follow this line diagonally until it intersects the line from the left scale corresponding to the temperature of the flue gases minus the temperature of the boiler room, or 530 deg. Then follow the vertical line to the top border and read the value 2,290, which is the loss in B.t.u. per pound of fuel consumed.

Fig. 2 shows the loss due to moisture formed by the burning of hydrogen in the fuel. It is read in a manner similar to the chart, Fig. 1, by finding on the bottom scale the value corresponding to the percentage of hydrogen in the fuel, and following the line diagonally to its intersection with the temperature line and then vertically to the top scale. This gives the value of the loss in B.t.u. per pound of fuel consumed.

The same chart can be used to find the heat loss due to the presence of moisture in the fuel. Since one pound of hydrogen, when it burns, forms nine pounds of water, the per cent weight of hydrogen contained in the moisture carried in the fuel is easily found by dividing the per cent moisture by nine. The total loss due to moisture in the flue gas can then be found by adding this percentage to the percentage of hydrogen in the fuel and using the chart as described.

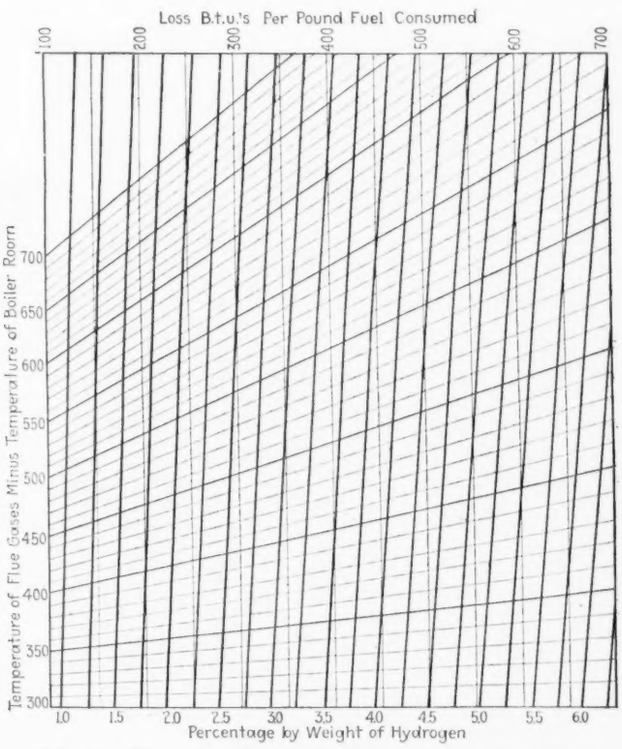

Loss B.t.u.'s Per Pound Fuel Consumed
100 200 300 400 500 600 700
Temperature of Flue Gases Minus Temperature of Boiler Room
700 650 600 550 500 450 400 350 300
1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0
Percentage by Weight of Hydrogen

Fig. 2—Chart for finding heat loss due to hydrogen in fuel

If there is no carbon monoxide in the flue gas, the total heat loss to the stack is the sum of the heat losses found from the two charts.

Lloyd's Register Shows that June 30, 1927, the oil engines under construction for seagoing vessels were as given in the tabulation. This table does not include engines to be used on harbor tugs, river craft, etc.

Country	Oil Engines No.	Oil Engines Indicated Horsepower
Denmark	25	93,150
France	10	43,180
Germany	48	**151,460**
Great Britain and Ireland	100	373,587
Holland	19	67,470
Italy	27	192,940
Japan	3	8,625
Norway	1	1,650
Russia	2	4,940
Spain	..	.....
Sweden	68	47,810
Switzerland	12	93,850
United States	8	20,210
Other Countries	1	3,552
Total	324	1,102,424

EDITORIALS

F. R. LOW, *Editor*

Prosperity and High Wages

WHEN the war boom collapsed, in 1921, and plants and unemployment spread, hurried conferences of employers agreed that in lowered wages lay the only hope. Wages, however, were not lowered and, in spite of that, prosperity soon returned. Now, for the last two years, one notes a changed opinion. High wages are receiving general support and are considered by most economists to help greatly in maintaining prosperity because of the widespread consuming power resulting.

But the psychologists say that it takes at least seven years for an opinion to become a mental habit. And high wages have been generally approved by industry for but two years. If, as has been stated by numerous foreign investigating commissions, high wages, combined with productivity, are the key to American success, we should take measures to see that there is no return to past conditions at the first sign of business storms. The lessons of the last few years should be so hammered home in the American mind that the connection between high wages and prosperity becomes a fixed idea.

What About Gas as a Fuel?

WITHIN the last few months the opinion has been expressed by several engineers, prominent in the heating and ventilating field, that in the future gas will be used as the fuel for heating in hotels, office buildings and industrial plants that do not require process steam.

Gas as a fuel has much to commend it. The very nature of it permits accurate control of both the rate of combustion and the efficiency of the combustion process. It is clean and requires little attention, which commends it to the small organization. The burning equipment is small compared to that required for oil or coal, and hence installation costs would be low.

Although increased efficiency and economy of heat may be obtained by its use, the present cost of gas, except in certain sections, is too high to justify it as a fuel.

There is no indication under present manufacturing processes that the cost of gas to the consumer can be reduced sufficiently to make it compete with oil and coal. That these processes may be improved or new processes invented to produce cheaper gas is a possibility that gas companies should bend every effort to achieve.

If Depression Comes

MANAGEMENT week, held throughout the United States from Oct. 22 to 27, serves to focus attention once more on the responsibilities of management. "In time of peace prepare for war" is a good maxim for government, and power-plant managers may well paraphrase this as: In time of prosperity prepare for depression.

Of course depression may not come. But to act on such an assumption is highly improper. Depressions have always come in the past, and whatever the results of the wiser, better business methods of the present may be, depressions may come in the future. In the face of the fact that all we can actually know of future conditions is that they will be different from those that exist at present, the wise plant manager will prepare for change and keep prepared.

One aspect of this situation that is, perhaps, not given the attention it deserves, was forcibly brought out by Henry S. Dennison in a recent speech. Labor conditions, he stated, are, throughout industry taken as a whole, generally good. The relations of managers and workers are apparently on a sounder basis of understanding and mutual confidence than ever before. Mr. Dennison suggests that, while these conditions hold, the time is here to build this confidence and co-operation so firmly into the structure of each industrial plant that it will weather whatever storms the future may bring. This suggestion is one that the power executive cannot afford to disregard.

Economy by Law

AT A RECENT engineering meeting a prominent member of the profession suggested that the day might come when we should have federal or state legislation prohibiting the operation of inefficient small power plants in establishments that could readily secure adequate power from large utilities. This suggestion was countered by another well-known member of the profession, who said that in Germany consideration is already being given to the enactment of laws to compel industries to generate their own power in every case where they can utilize an adequate portion of the incidental waste heat. This is an intelligent recognition of

the fact that a plant, however small, that utilizes its waste heat to a sufficient extent can produce power for less fuel for less money than the most economical central station thus far devised. Of course the interest of the government in conservation, while subject to some argument, is its only rational justification for entering the field of engineering with restrictive legislation, and in Germany, where fuel is just now more difficult to secure, the importance of conserving it to the utmost is obvious.

In the United States the fuel resources are more and more readily obtainable, so that there is no immediate public necessity for attempting to force people to save coal whether they wish to or not, and experience with attempts to force people to do or to refrain from doing things unpleasant and pleasant does not seem to augur well for further attempts along that line. Moreover, the American is notoriously believed to be influenced by the almighty dollar. It should be totally unnecessary to attempt to force him to generate his power by means that are well known to be cheaper. The odd thing is that the American business man not infrequently refuses to save money by this effective method.

Power Factor and the Coal Pile

SOME of the bad effects of low power factor in alternating-current circuits are generally appreciated, while others are not. The increased cost of equipment to supply a given kilowatt load, the increased losses in the lines and machinery and the increased voltage drop are generally accepted as being associated with a poor power factor. The increase in the coal consumption due to low power factor may be, under certain conditions, far more important than is usually realized.

If the units in a plant operate at the power factor for which they are designed, then the power factor of the system affects the coal pile only so far as it increases the losses in the system. However, if a machine has been designed for one hundred per cent power factor and is supplying a load that has a power factor of sixty per cent, the amount of fuel to supply the load may be materially increased over that required at near unity power factor.

This increase in fuel is caused by the prime movers of the units in service being only partly loaded and operating more units to carry the load than would be required if the power factor were nearly at the value on which the design of the machines was based. A unit designed for unity power factor supplying a sixty per cent power factor load, has its prime mover only about sixty per cent loaded when the generator is supplying one hundred per cent kilovolt-ampere load.

A load of three-thousand kilowatts at unity power factor may require a generator capacity of about four thousand kilowatts to carry it safely, and two units of this combined capacity will have a water rate of about fourteen-and-one-half pounds per kilowatt-hour, with moderate condition steams. A kilowatt load of this value at sixty per cent power factor will require about six thousand kilovolt-ampere generator capacity, if the same reserve is maintained as previously allowed. This will require another machine on the system, in which case the station water rate will increase about one and one-half pounds per kilowatt-hour. This increase in water rate would require the burning of about six hundred additional pounds of coal per hour, assuming a fair rate of evaporation. In a plant of this size, such an increase is worthy of careful consideration and shows that the coal pile should not be overlooked when considering the cost of low power factor.

A Museum of Power-Plant Practice

EUROPE has long led in its industrial museums, of which the Deutsches Museum in Munich, the Technical Museum in Vienna and the South Kensington in London are outstanding examples. In these the early history, the development and the processes of many industries are portrayed.

In this country art, natural history and mineralogy are well covered by our several museums, but not so as to the mechanic arts. The Smithsonian, of which the National Museum at Washington forms a part, contains many fine models and actual specimens of mechanical equipment that mark achievements in the fields of railroading, communication, aviation, etc.; but in few if any lines do the exhibits represent a complete and consecutive history of the developments. This is especially true of the field of steam engineering. The reason lies in the American habit of neglecting to preserve records and models through which development of modern mechanisms can be traced.

Happily, there are indications of awakened interest in the collection and preservation of such milestones in mechanical progress. Such are the recent establishment of the Museum of Peaceful Arts in New York and the attempt to found a National Museum of Engineering. Now comes the welcome announcement that the National Museum at Washington is about to build up a unit covering the field of "steam power plant engineering." The few models in its possession will be added to through the construction of others built by aid of reference to manuscripts on file, until there is represented a complete line covering the early history (especially in England), American developments beginning about 1755, and modern practice.

The idea is an excellent one and deserves the support of all who may be in a position to offer constructive help through the loan of old manuscripts, records or models.

IDEAS *from* PRACTICAL MEN

Readers are urged to use this department for the exchange of practical operating information. A minimum of five dollars will be paid for contributions accepted

Chart for Showing the Amount of Water Used by Condenser

ALONG the line of practical suggestions, I am submitting a chart giving a quick method of calculating the water consumed by jet condensers. I have found this chart invaluable in making up water distributions.

In order to clarify its use, start at the top abscissa, "Temperature of water out of condenser," which is the same as the hotwell temperature. Follow the dotted line down to the vacuum lines and horizontally to the "rise in temperature" lines, and finally down to the lower abscissa, which gives the gallons of water per pound of steam.

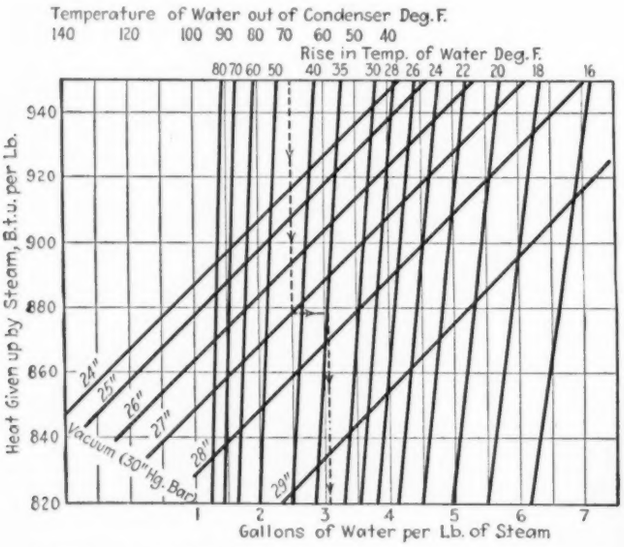


Chart shows gallons of water per pound of steam

I believe that this chart would be a valuable addition to most engineers' notebook. C. W. STEVENS.

New York City.

Painting Insulated Pipe Lines

DIFFICULTY is usually experienced when an attempt is made to paint insulated steam pipes without proper sizing. The insulating material is usually of an absorptive nature and consumes large quantities of paint when the first coat is put on.

A thin coat of glue can be brushed on before painting, and will furnish a hard, non-absorptive surface for the paint. Ordinary flake glue, such as that used in furniture making, is excellent for the purpose and dries quickly. It is generally mixed with water and cooked until thoroughly dissolved, then applied while warm. The mixture for this purpose should be thin enough to spread easily with a brush and will not require much of the flake glue. Special glue preparations for sizing plastered walls and other such surfaces are obtainable and may be successfully used if desired.

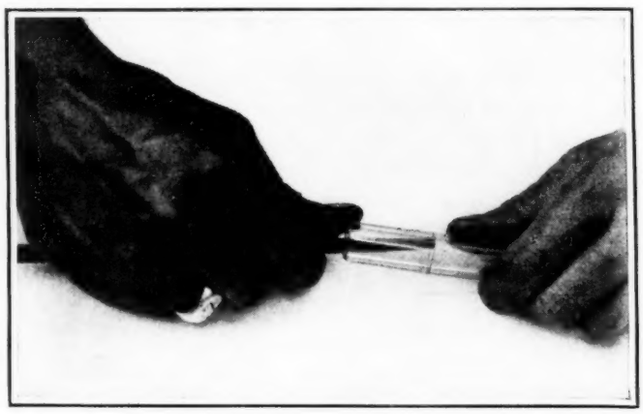
If only a small amount of insulation is to be painted, it might not be worth the trouble and expense of applying a sizing coat, as the first coat of paint, if put on in sufficient quantity, will make the surface satisfactory for a second coat. The saving in paint will make it economical, however, if any quantity of the work is being done. K. M. WHITE.

Chicago, Ill.

Round File Makes Good Substitute for Standard Gage-Glass Cutter

THERE are some elaborate devices, home-made and otherwise, for cutting off glass tubing, but an old rat-tail file can hold its own on the job any time.

A keen cutting point can be secured by laying the end of the file over a piece of iron or clamping it in the vise and breaking off an eighth of an inch or less. A good leverage is obtained by the file against the mouth of the tube as it is turned around on the inside at the point marked for breaking off. When the end of the file gets a little dull, break off another bit from the end and employ the sharp point as before.



Round file used as gage-glass cutter

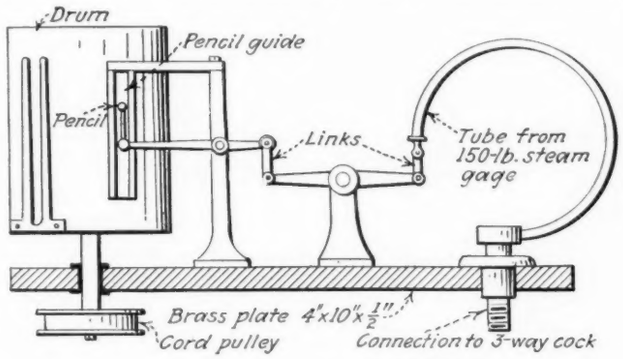
I have used old small round files in this manner for a long time and have never lost a cut or spoiled a glass.

Missouri Valley, Iowa. F. W. BENTLEY.

Home-Made Steam-Engine Indicator

A SHORT time ago I saw a home-made steam-engine indicator that appealed to me as being rather novel, so I made a sketch of it, and I thought it might be of interest to *Power* readers.

As will be seen from the illustration, it is made with a tube from a 150-lb. steam gage, the drum of an old indicator, and interconnecting links, the whole being



Details of home-made indicator

mounted on a brass plate. The engineer who made it could not convince the owner that an indicator was useful or necessary, so he had to make one. After he had taken some diagrams off his engines and showed the Boss where some of his money was going, he got the necessary repairs for his engines, but not an indicator.

He showed me the indicator in operation, and while it may not be 100 per cent accurate, it comes close enough to show actual conditions. Truly, it is said that where there is a will there is a way. THOMAS M. STREET.

Wilkes-Barre, Pa.

Loose Valve Seat Causes Engine To Slow Down

ONE morning when the attendant was starting the pilot engine, he heard a light metallic click and at the same time noticed the tachometer pointer going gradually back. Before the click was heard, the engine was doing about 400 r.p.m., the full speed being 600. He could not understand what had happened, so he opened the valve a bit more and the engine came up close to full speed. Again, in the afternoon and for a few days thereafter the engine behaved in the same way until the defect was found and corrected.

First, I suspected the throttle valve, but it was found to be in good condition when opened. Next, I dismantled the governor gear and readjusted it, but to no avail. Finally, I opened the starting valve and examined the seat and valve, and nothing appeared to be unusual with these. But while I was grinding the valve, I detected a slight movement in the seat and upon examining it closely, I found the play in the seat to be a little over $\frac{1}{32}$ in., even though a setscrew was used to hold it in position. This setscrew also was responsible for diverting my attention from the actual source of the trouble.

What actually had happened to lower the speed of the engine so suddenly every time it was started, was that the seat remained in its proper position for a while after the valve was opened to admit steam, and when the engine attained some speed, the seat became loosened by the vibration and was forced forward against the valve face by the steam, causing it to reduce the area of the opening. When a new seat had been made and pressed into the body of the valve and a setscrew added to insure further security, the trouble disappeared. F. C. BULSARA.

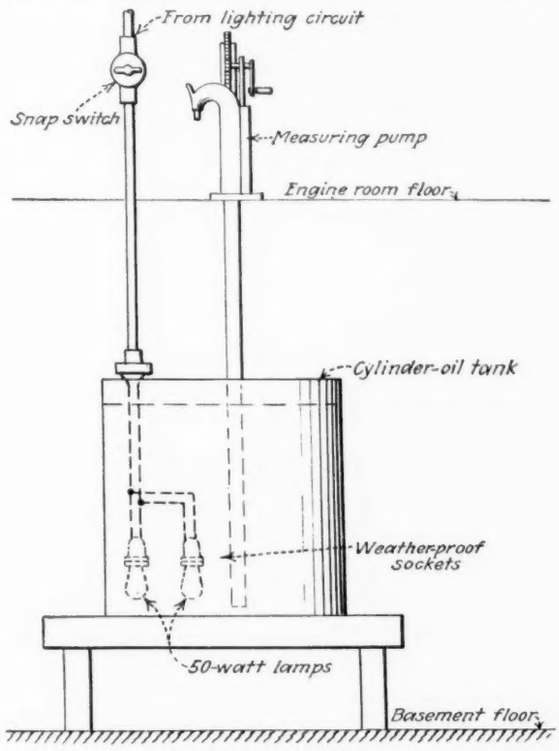
Nagpur City, India.

Novel Way to Keep Heavy Oil Warm

ALMOST every engineer has had his patience tried when handling heavy cylinder oil in cold weather.

On the first engine job that I had, the cylinder oil was kept in a barrel in one corner of the boiler room, and nearly every time I went to draw oil it was so slow that something else generally happened to attract my attention before the old coffee pot was full. Almost invariably when I got back, there was a good-sized pool of oil on the floor.

In a more modern plant the oil was kept in the basement in a tank. A measuring pump was set on the engine-room floor, and the suction extended through the floor and into the tank below. This arrangement worked



Lamps suspended in tank keep the oil at right temperature for pumping

well in warm weather, but the oilers found it difficult to get the pump to handle the oil in cold weather.

To overcome the difficulty, two weatherproof sockets were connected through a snap switch and fuse to the lighting circuit. The sockets were supplied with 50-watt bulbs and immersed in the oil. Kept lighted in cold weather, they warmed the oil enough to flow freely.

The same plan was used successfully to keep the oil warm in the mechanical force-feed lubricators on a battery of large gas engines.

Kansas City, Kan. JOHN J. SYTHE.

COMMENTS *from* READERS

Filling Engineering Positions

THE need for replacing a valuable man often comes without warning. Sometimes a subordinate can be promoted, but more often a new man must be sought.

The question arises as to where this man can be obtained. The position may have peculiarities that must be safeguarded. The candidate must be thoroughly acquainted and indisputably conversant with the particular work. If he is required to travel, which is likely to be the case, then he must be tactful, diplomatic and studious. He must think creatively and be moderate in his ideas and have the courage of his convictions. The company's interests may take him to foreign lands, which would make the position still more difficult. International travelers have qualifications peculiar to their own set. They possess additional languages, ability to deal with many nationalities, all having varying temperaments.

Shrewdness and perception are every-day utilities.

A new man must be more cautious, since his inexperience handicaps him in many ways.

Thus we cannot help sympathizing with an executive confronted with the task of keeping his organization up to a high standard.

Securing a choice of men is difficult, but picking a suitable man from their number is more difficult still. Good men, as a rule, are not unemployed for long, and the many avenues open for advancement are not utilized by them indiscriminately. Rather than jeopardize their present connections, they will not take the risk. That is probably why, when a vacancy is announced, a great many men present themselves who do not possess the requisite qualifications.

The statement made by an English firm that men for positions paying less than $5,000 a year are easily obtained, but that those from $5,000 to $10,000 are few and far between, and those over $10,000 are scarce, is not difficult to understand.

The advertisers themselves are to blame for this. When offering a position, they should also confer protection in the form of confidence. A young man may stand well with his company and possess qualities and abilities absolutely wasted where he is. He may be thoroughly practical and, having educated himself on the theoretical side of his profession, has outgrown his job. He would probably be a valuable man to several firms, but cannot, without considerable risk, make this fact easily known.

It is not proper to have men moving from one position to another. But it is in line to put each man where he will be of the greatest use to industry or commerce.

The college student is said to lack practice and the practical man, theory. Both lack essential qualities for big jobs. The man who, however, possesses both, tempered with moderation, is the desirable man. He is not easily obtainable because he is generally too busy to think about new connections.

Unless employers set out at the start to make a confidential friend of an applicant, the scarcity of good men will always be evident. As an example: the advertiser should state that the application would be held strictly confidential; that all applications not conforming strictly to requirements will be turned down. This should bring out the type of man desired. After a preliminary examination those applications not proving acceptable would be returned with the proper acknowledgment. Every employer has a certain amount of faith in his own judgment, so an interview with each of the candidates should follow. If the applicant, upon being interviewed proves satisfactory, his references would then be inspected. If these are equally satisfying, it can almost be taken for granted that his present employer would give him a good recommendation. In any case his immediate connections should not be investigated until he has proved suitable in every other direction. S. G. WILLIAMS.

New York City.

* * * *

Pumping Boiler Feed Water

WITH reference to the article on page 208 of the Aug. 9 issue entitled "Pumping Boiler Feed Water," I wish to offer the following comments:

A statement is made regarding centrifugal boiler-feed pumps to the effect that when designed for pumping hot water, the inlet pipe is required about three times as large as would ordinarily be used for cold water; sharp turns and constricted passages must be avoided to prevent the release of steam, which would cause the pump to become vapor bound and result in reduced pump efficiency, also difficulty would be encountered in maintaining the supply of water.

The foregoing statements may be true in a sense, but the size of the suction or inlet piping does not assure satisfactory operation in all cases. More attention must be paid to the selection and location of the boiler feed pump with respect to the source of hot-water supply. A pump should be selected which will not only meet discharge operating conditions, with the most desirable characteristics, but also meet the existing suction conditions. Careful study of suction conditions and the selection of a proper pump for the conditions involved is essential for satisfactory operation. Such study and selection will eliminate conditions as stated in the article, provide the installation with a large surplus supply, maintain higher pump efficiency, and it will reduce maintenance charges, since experience indicates that wear is more rapid when the pump is not properly installed or designed to meet existing suction conditions.

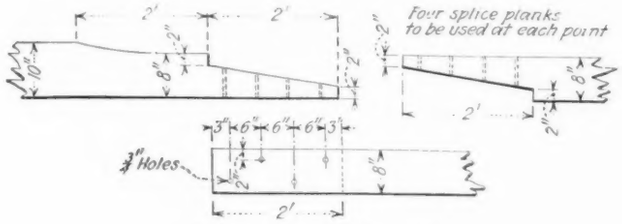
By following the foregoing procedure the expense of designing an oversize suction pipe and fittings may be avoided. M. M. KLOSSON, Designing Engineer,

Buffalo, N. Y. Buffalo Steam Pump Co.

How Would You Do It?

IN REPLY to Mr. Simmons' article, "How Would You Do It?" in the August 9 issue, I would suggest the following method:

Erect a gin pole about 115 ft. in length. This pole can be made up from 40-ft. lengths of straight-grained, tough and resilient timber. The first length of 10x10-in. stock is tapered so splice planks will conform with next length, which is 8x8 in., and this is also tapered to splice to the third and last length, which is 6x6 in. The accompanying sketch will give an idea of a good splice.



How the splice is made

Bore a 1⅛-in. hole 6 in. from the top of the pole, which is the small end, and put in two ½x7-in. split bolts above and on opposite axis to the 1½-in. hole, then put in a 1⅛x16-in. bolt and wedge it in place.

Above this bolt make a loop around the pole with ½-in. chain to hold the blocks, and also fasten a 1-in. rope at this point. Have the rope long enough to reach to the corner of the adjacent building and then through a single sheave block secured in the foundation or to a deadman. The butt of the gin pole will be put at the foot of the stack and a proper footing made so it will not sink when the weight of the stack is brought upon it. The pole must be secured at the foot to prevent its slipping endwise while it is being raised, and three ⅞-in. ropes should be fastened to the top for guying it in an upright position. Provision must be made for a man to go up the pole to put a chain around the stack and also to hitch the blocks for raising and lowering it. This is readily provided by nailing crossbars at 14-in. centers while the pole is on the ground. Next, attach a single sheave block threaded with ¾-in. rope, to the top of the pole for use in hoisting the chain required to make the hitch on the stack and the block and tackle for lowering it.

Everything is now in readiness for raising the pole. With the butt of the pole at the base of the stack raise the top end to an angle of 40 to 45 deg. from the horizontal by lifting it with the hoist or raising and blocking by steps. From this angle raise it to a vertical position with the 1-in. line secured to the top of the pole and running through the block at the corner of the building, as mentioned previously. Power for this lift may be a team of horses or the niggerhead of a hoisting engine. The latter is the most satisfactory, as the lifting can be done by inches and the strain held. During the raising of the pole men should be stationed at each one of the three ⅞-in. guy ropes to steady it, and when it is in the proper position the guys may be secured fast.

There are the three stack guys to contend with during the raising of the pole. Guy *A* may be swung farther west, say 20 ft., and thus be out of the way. The guy snubbed to the boiler-feed tank may be secured farther east by the wall behind the boilers. The guy running west from the stack is important, and it should be loosened just long enough to get the pole above it, then secured again.

With the gin pole up, it is now necessary to put up the double blocks stretched out to a length depending on the lift required to raise the stack off the base, allowing a couple of feet more so the blocks won't jamb. The line from these blocks will now be threaded through a single sheave block and to the source of power.

To put the chain around the stack, the man will require a reacher made from ¼-in. pipe, bent to a gooseneck. The chain should have a double wrap, bringing the last wrap over the first with a tightening hitch.

Before raising the stack, secure a rope around the bottom of it, and this will be used to get the bottom in a northeasterly direction as it is being lowered. The guys may all be loosened now and men assigned to them until the stack is in a horizontal position, when it will be nearly on the ground.

By such a method the stack is in a good condition and the gin pole is in place to erect the new stack.

Winnipeg, Man., Canada. ERNEST CASSON.

* * * *

Why Compression Is Necessary

THE technical questions and answers now running in *Power* are a source of most useful and interesting information, and I presume will be available in book form at the proper time, making them of great value to engineering students in colleges and others who are trying to get a better education. However, some of the answers may well be questioned.

Question 4 in the Sept. 6 issue, "Why is compression used in reciprocating steam engine?" is answered as follows: "Compression is used to offset the inertia forces of the reciprocating parts so that the bearings do not pound as the crank passes dead center."

This answer might apply to single-acting steam engines with loose bearings, but the main reason is a question of

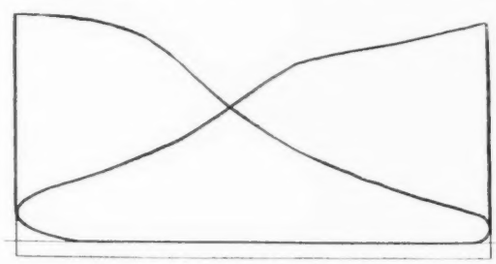


Fig. 1—Indicator diagrams without compression

economy in filling the clearance with exhaust steam instead of live steam from the boiler.

Internal-combustion engines during the eduction stroke have no compression, yet, until the bearings become badly worn, are free from pounds when the reciprocating parts pass the centers. This refers to the single-action type.

A crank and piston has the same motion in a steam engine that it has in a Diesel, although in the Diesel the reciprocating parts are much heavier, yet the Diesel has compression but half the time, or on every other up stroke, and often runs more quietly than a steam engine of equal cylinder dimensions.

It was claimed that the first double-acting tandem gas engine was noiseless because it had compression at the

end of every stroke. But when one explosion chamber was cut out while the engine was in operation, there was no evidence of more noise. So the argument that compression offsets the inertia has no leg to stand on.

As reciprocating engines, either steam or gas, can run quietly without compression and without pound, my opinion is that compression is more useful to keep up the efficiency than to make the engines run quietly.

Orrville, Ohio. C. E. SARGENT.

[In order to explain why the editor feels that the answer given is the correct one, it is necessary to consider the influence of inertia forces as well as cylinder pressures.

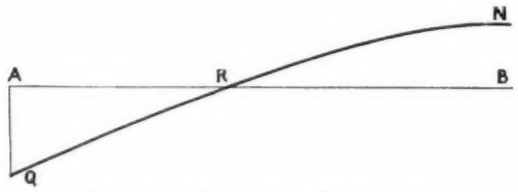


Fig. 2—The inertia force curve

Let us take an engine operating without compression, giving indicator diagrams as shown in Fig. 1. If cylinder pressures only were influencing bearing pressures, it would seem that at the end of the head-end stroke the pressure exerted on the piston and on the wristpin bearing would drop to practically zero, to be succeeded by the initial pressure in the crank end urging the piston on the return stroke. It might be argued that the bearing would not pound, since the pressure gradually disappears toward the end of the stroke.

However, the inertia of the reciprocating parts must be considered. This force necessary to accelerate and slow down the piston and other reciprocating parts has a negative value during the early part of the stroke, and a positive value during the rest of the stroke, as shown in Fig. 2.

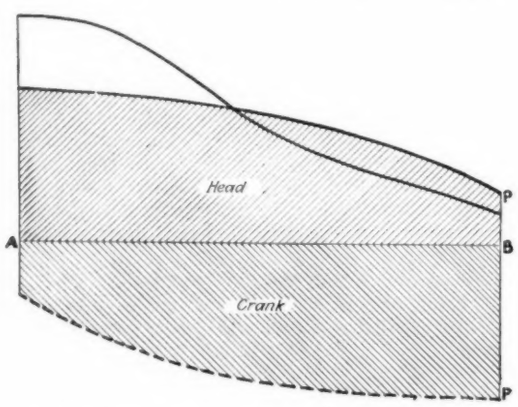


Fig. 3—The net force diagrams for both ends

Combination of the steam and force diagrams for both ends of the cylinder gives the two net-force diagrams shown in Fig. 3. It will be seen that at the end of the stroke the pressure is proportional to *PB* above the base line, and this is succeeded immediately by a force in the opposite direction as shown by *PB* below the base line. This change of pressure will cause the bearings to pound and a high rotative speed would be out of the question.

If, now, we give the engine some compression we obtain diagrams as shown in Fig. 4.

Combining these with the inertia force curve, one obtains the shaded area shown at the top of Fig. 5, as the net force diagram for the head end. When this is brought down to the horizontal line as a base, we obtain the lower diagram in Fig. 5. Note that the pressure changes at *R* from positive to negative and when the steam enters the crank end of the cylinder it only augments the pressure on the bearing, but does not change the direction of the bearing pressure.

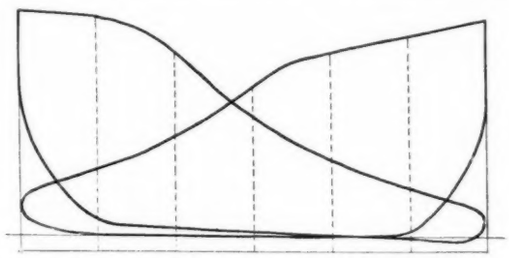


Fig. 4—Engine is given compression

To obtain this condition is the reason for compression. If the reciprocating parts are heavy or the speed high, the pressure changes might be deferred until dead center, resulting in a pound. To correct this, the compression should be increased to make the pressure occur before dead center.

If the steam had no heat interchange with the cylinder walls, the ratio of compression should be equal to the expansion rate. In the everyday engine, however, compression is used merely to obtain quietness of operation. It should be understood that the shapes of the various diagrams are approximations only, but they illustrate the conditions to be encountered.—EDITOR.]

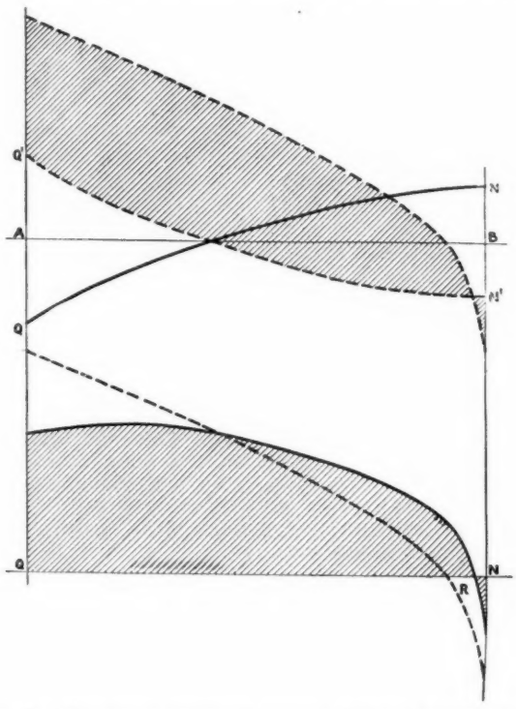


Fig. 5—Pressure reversal occurs before dead center

NEWS *of the* FIELD

J. J. Carty Awarded John Fritz Medal for 1928

In recognition of his notable achievements in the development of modern telephone engineering, General John Joseph Carty, vice-president and chief engineer of the American Telephone & Telegraph Co., became the 24th recipient of the John Fritz medal award, that for 1928, on the unanimous decision of the board of award, October 21.

The presentation of the medal will take place in February, in connection with the annual meetings of the American Institute of Electrical Engineers, in the Engineering Auditorium, 29 West 39th Street, New York City. The medal will be presented to General Carty by Robert Ridgway, chairman of the board.

Awarded once a year for distinguished scientific or industrial achievement, the medal is a memorial to John Fritz, late of Bethlehem, Pa., long a leader in the American iron and steel industry.

Planned New York Telephone System

General Carty, who received his rank on the staff of the Chief Signal Officer in the United States army during the world war, began work with the Telegraph Dispatch Co., Boston, in 1879. He soon invented a test system for the multiple switchboard form and installed the first metallic circuit multiple switchboard. In 1887, he was put in charge of the cable department of the Western Electric Co. and later of its switchboard department. He made many important improvements in design and installation, including a fundamental invention on which was based the common battery switchboard that came into universal use. In 1889, Carty entered the service of the Metropolitan Telephone & Telegraph Co., which is now the New York Telephone Co., as electrician, and later became its chief engineer. Under his direction, the basis was laid for the comprehensive New York telephone system.

Other Notable Achievements

In 1907, he became chief engineer of the American Telephone & Telegraph Co. Among his notable achievements are the transcontinental line, 3,400 miles long, opened to commercial use January 25, 1915; the 450-mile cable system between Washington and Boston and successful demonstrations of wireless telephony from Arlington, Va., to California, to Hawaiian Islands and to Paris.

He has conducted many scientific researches and has been a leader in encouragement of research. His papers, "A New View of Telephone Induction," "Inductive Disturbances on Telephone Circuits," and "The Theory of Transpositions," record epochal advances in the theory and operation of telephone systems.

General Carty is a past-president of the American Institute of Electrical Engineers, and has been an officer or member in other scientific and engineering organizations, including New York Electrical Society, Telephone Pioneers of America, National Academy of Sciences, National Research Council,

General J. J. Carty

American Philosophical Society, Franklin Institute, Carnegie Institution of Washington and the Carnegie Corporation of New York.

Oklahoma Boiler Code Being Simplified

The Oklahoma boiler code, which is the law allowing the state labor commissioner to regulate boilers for the prevention of explosions and disasters at industrial plants, is being revised by the labor commission, W. A. Murphy, commissioner, announced, Oct. 21.

In revising the statutes, many phrases will be simplified and many unnecessary clauses eliminated, Commissioner Murphy said, as the present code is difficult to understand.

"None of the rules will be eliminated in the revision," Murphy said. "The revision is only for the purpose of simplifying the language."

The state laws give to the commissioner the authority to make such rules as he believes should apply for the safety of boiler workers.

McGraw-Hill, A. W. Shaw Co. Sponsor Subsidiary

Incorporation of a subsidiary to publish four long-established national circulation industrial publications has just been announced by the McGraw-Hill Publishing Company, of this city, and the A. W. Shaw Company, of Chicago. The subsidiary is the McGraw-Shaw Company, and the papers affected are *Factory, Industrial Management, Industry Illustrated* and *Industrial Engineering.*

"*Factory*, heretofore published by the A. W. Shaw Company, and *Industrial Management*, recently acquired by the McGraw-Hill Publishing Company, will appear in January as one publication under the name of *Factory and Industrial Management.*

"*Industrial Engineering*, heretofore published by the McGraw-Hill Publishing Company, and *Industry Illustrated*, recently acquired, will appear in December under the name *Industrial Engineering* with which is consolidated *Industry Illustrated.*"

The arrangement by which the two parent companies will control jointly a subsidiary publishing four important papers devoted to industry is not in any sense or degree a merger of the McGraw-Hill and Shaw groups of journals, James H. McGraw, president of the McGraw-Hill Publishing Company, said today. He pointed out that the two organizations have effected a separate subsidiary organization in order to serve more adequately in a publishing way those manufacturers whose broad marketing problems extend throughout the range of industry. Mr. McGraw is chairman of the board of the new company.

A. W. Shaw, of Chicago, is president of the newly incorporated organization. Malcolm Muir, vice-president and director of sales of the McGraw-Hill publications, and Wheeler Sammons, of the Shaw Company, form the management committee. G. E. Conkling, of the McGraw-Hill organization, has been assigned to the new company as acting publisher.

New British Columbia Utility

Articles of incorporation have been granted to the West Canadian Hydro Electric Corp., Ltd., a company organized in the province of British Columbia, with a registered capital of $1,000,000. It will develop hydroelectric energy at Shusway Falls to supply electricity to the City of Vernon. The company has a 25-year contract.

Smithsonian Institution Plans Steam Plant as Exhibit in National Museum

Permanent Unit to Initiate Development of Engineering Museum Depicting Phases of Progress—Seeks Early Models

INDICATIVE of the Smithsonian Institution's interest in the movement now under way for the establishment of industrial museums, the Divisions of Mineral and Mechanical Technology of the National Museum have been authorized to proceed with the development of a single unit of such a museum in accordance with the best modern museum practice. The unit, in operation, should indicate the service which can be rendered and will serve as an example of just what constitutes an engineering museum.

Steam power plant engineering has been selected as the subject to be treated in this demonstration unit. When completed this will function as though it were a part of the complete engineering museum.

The industrial and engineering sections of the United States National Museum in Washington were organized over forty years ago, and since that time the collections have been expanding continuously until now almost every branch of industry and engineering is represented. They are crowded into nearly 90,000 sq.ft. of floor space but lack of sufficient room at any one time, and of sufficient personnel, have prevented the development of the material into more than a semblance of an engineering museum.

Models to Depict Progress

Approximately 3,000 sq.ft. of floor space with 14½ ft. ceiling height will become available in the next few months, which is to be used for this new undertaking and limits it to the presentation only of the most significant steps of development.

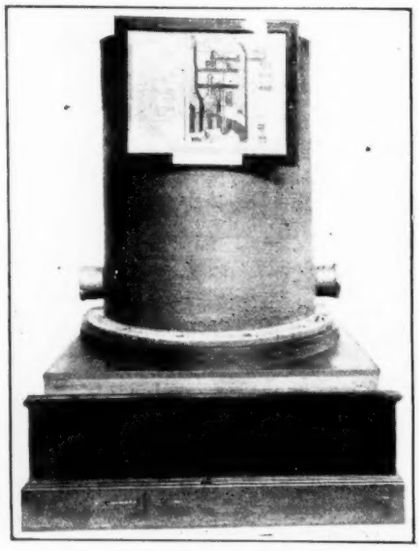
It is planned to treat the subject in two parts: One, its history, and the other, modern practice. The early history is the history of the steam engine and accordingly a series of models will be constructed to illustrate the progress made from the toylike turbines of the ancients to the engines of Newcomen and Watt.

Hero's aelopile, Branca's impulse turbine, DeCaus' steam fountain, Savery's pulsometer, Papin's cylinder and piston, and Newcomen's atmospheric engine are to be constructed in miniature and exhibited with related manuscripts, translations, engravings, and drawings. It is hoped to exhibit one of Watt's improved engines, preferably an original, but if this is not available, a restoration will be used.

A few models of boilers of the 17th and 18th centuries, too, will be shown, completing the pre-American history.

The purely American developments begin after 1755 when the steam engine was first introduced in America by Josiah Hornblower, and from this date the exhibit will be confined to the significant steps of American developments. The Museum has the only remaining relic of Hornblower's engine, namely, a section of the cylinder, and it is planned to exhibit with this relic a miniature restoration of the engine on its original location. The Museum has nothing illustrative of the early developments in this country between 1755 and 1803 although this period it is thought should be represented. James Watt sold several engines to purchasers in New England during this time, and Oliver Evans, our own pioneer steam engine builder, had by 1815 constructed some fifty engines.

Evans is credited with being the first to make a compact high-pressure engine cheap enough for practical use, and ranging from 10 to 25 hp. He called his engine the "Columbian" and made it at his own establishment, known as the Mars Iron Works, in Philadelphia. His engines were in use in Providence, Pittsburgh, Marietta, Philadelphia, as well as in the States of Florida, Louisiana, and Mississippi. Furthermore, Stackhouse and Rogers built engines at Pittsburgh under his patent, and, lastly, Evans built and erected in 1817 the engine and boilers for the Fairmount Water Works in Philadelphia. It does not seem possible that so many objects of the nature of a steam engine should not have left a trace, so the Museum hopes to locate one.



Jonathan Hornblower Engine Cylinder

Upper half of all that remains of the first steam engine erected on the Western Continent in 1753. Preserved in the National Museum.

Following Evans, the work of John Stevens of Hoboken and Nicholas Roosevelt of New York is to be represented, as well as other significant steps of development up to the middle of the 19th century.

From this date on, it is proposed to divide the subject into the separate developments in design of boilers and engines. In each case three or four steps are to be selected to show the salient features of American practice for that period. It is planned to include a horizontal engine of the slow speed, mill-driving type of about 1830, and a small Corliss engine of as early a date as may be in existence.

Modern Practice Represented

In the boiler group it is proposed to have represented one or two early water tube designs prior to the standard inclined tube type, featuring those developed by Stephen Wilcox and the Stevens, father and son. Some space will also be devoted to a short presentation of the thermodynamics of boilers and engines to show by models, indicator cards, diagrams, and tables just what the problems of the industry are and to indicate the reason behind the developments and improvements as shown.

The last part of the proposed exhibit will be entirely devoted to modern practice. Steam power plant engineering will be presented as an industry using fuel as a raw material and producing power as a finished product. Fuel and ash-handling equipment, turbine room, condensers, boilers, draft equipment, etc., will be represented by models and full size objects when possible. The control side will be shown by a section of power plant instruments, and one or two models to quite a large scale will emphasize the turbine and condenser elements to finish the history of the steam engine.

The Museum has expressed interest in information relative to the engines of Watt, Evans, and Roosevelt, and the existence of any steam engines earlier than 1830; of an early Corliss; and of early types of steam engine and boiler equipment.

Edward J. Fowler, Head of Pacific Foundry, Dies

Edward J. Fowler, mechanical engineer and foundry metallurgist, president and general manager of the Pacific Foundry Co., San Francisco, died October 18 in that city after a brief illness.

Mr. Fowler, a native of Michigan, was with the Union Iron Works in the capacity of metallurgist until 1904 when he established the Pacific Foundry Co. of which he was president and general manager up to the time of his death. Funeral services were held from his home in Redwood City, Calif.

Declares Power Development Problem for States

States should "take a far greater part than any of them are now taking" in the control and regulation of water power, the executive secretary of the Federal Power Commission, O. C. Merrill, says in a statement issued in the *United States Daily*, October 25.

Power development is primarily a state problem, Mr. Merrill said. He added that the Federal Power Commission has no desire to enter the field of rate or service or securities regulation in any case where the state can act.

Asking co-operation between states and the federal government, Mr. Merrill said that in his opinion it is better that the authority of the two agencies should overlap than that there should be any zone within which neither has authority.

"Notwithstanding the present tendency toward interconnection and the extension of great systems over the territory of several states, power development after all is primarily a state problem with respect to which the states should assume the major responsibility.

"The Federal Power Commission is not jealous of its authority. It would welcome the passage of laws by the states which would take a far greater part than any of them are now taking in the control and regulation of water-power development and use. It has no desire to enter the field of rate or service or securities regulation in any cases where the states can act. It would prefer that the states should assume responsibility for inspection of construction and for auditing of accounts.

URGES COMPREHENSIVE STATE LAWS

"It would welcome the determination by the state of the projects to be developed and the agencies by which it should be done, and it will give its fullest co-operation in working out with the states a mutual program of power development in the public interest.

"It finds, however, but few states in a position to do so. I would urge, therefore, the passage of comprehensive state water-power laws based on the policy of full public control over this most important among our resources; and while I may not assume to say what policy any state shall adopt, I may, nevertheless, properly direct your attention to the principles laid down in the Federal Water Power Act as probably better calculated to protect the public interest than those adopted in any other existing legislation."

License for Savannah River Project Likely

A license probably will be granted at an early meeting of the Federal Power Commission to the Savannah River Electric Co. covering a project at the Clark Hill site on the Savannah River fifteen miles above Augusta. The work done by the company under its preliminary permit has been studied by the staff of the Commission and has been approved.

The Savannah company will build a 90-foot dam which will create a reservoir covering 40,000 acres. It is planned to install 120,000 hp.

R. W. Gillispie Now General Manager of Jeffrey Mfg. Co.

Announcement of the election of Robert W. Gillispie as vice-president and general manager of the Jeffrey Manufacturing Co., Columbus, Ohio,

Robert W. Gillispie

was made October 22, following Mr. Gillispie's assumption of his new duties October 10.

For several years Mr. Gillispie was connected with the Bethlehem Steel Co. in an executive capacity. He joined the Jeffrey organization as vice-president and assistant general manager July 1, 1926.

President Open to States' Plans for Boulder Dam

Assurances that the Administration would not be opposed to any agreement reached by the seven Colorado River States for Federal development of the river, including Boulder Dam, were given to George H. Dern, Governor of Utah, at the White House on October 22 by President Coolidge, the Governor stated orally after a conference with the President.

Governor Dern, who was chairman of the recent conference held at Denver by representatives of the seven States to agree on a plan for development of the Colorado River, called on the President to inform him of the results of the conference. The Governor informed the President, he said, that he was hopeful that the States, at a further conference to be held shortly, would reach an agreement.

Sees Settlement Nearer for Ottawa Power Project

Developments in the power situation in eastern Canada are expected to result from a political conference on power matters which is scheduled to take place in Ottawa early in November.

During the last few months there has been considerable controversy over federal and provincial rights. It has been conceded that both authorities have rights—the Dominion government in respect to navigable streams, and the provinces in respect to the ownership of the beds of such streams. Heretofore each authority has displayed a decided disposition to stand on and fully assert its own claims. This has been manifested with regard to the St. Lawrence plan and also the great unharnessed power at Carillon, on the Ottawa River. This particular site is being held up from development because of the conflicting authority and the impediment to successful financing created by the doubts that exist.

Two courses are open and it is asserted that one or the other will be followed: (1) The Dominion and the provinces, respecting each other's rights, will get togther in joint agreement looking to the development of the power, or (2) the matter will be made the subject of a special reference to the Privy Council in England to decide, once and for all, the relative spheres of jurisdiction.

Claims American-Soviet Trade Doubled Since World War

American-Soviet trade conducted by the four principal trading organizations here showed a turnover of $78,380,592 for the Soviet fiscal year ending September 30, as compared with $65,328,175 for the previous year, an increase of 20 per cent, reports the Amtorg Trading Corp., New York City.

Exports from the United States were $63,524,037, a gain of 22 per cent, and imports were $14,856,555, a gain of 14 per cent. These figures do not include imports of manganese for the period, which amounted to $2,901,294, according to the United States Department of Commerce figures, and furs worth several million dollars imported under concession by Eitingon-Schild. These two items would bring the trade turnover up to approximately $90,000,000. The pre-war trade turnover between the two countries was about $48,000,000.

The four trading organizations making returns are the Amtorg Trading Corp., the All-Russian Textile Syndicate, Centrosoyus and Selskosojus. The last two are the trading bureaus of the Soviet Consumer's Co-operatives and the Agricultural Co-operatives, respectively.

Steam Unit for San Antonio To Burn Texas Lignite

Another unit steam power plant capable of developing 40,000 hp. is being planned by the San Antonio Public Service Co. to care for the increasing load of San Antonio.

The additional plant, to be put in either in conjunction with the New Braunfels unit or built on a 50-acre site owned by the company at a point on the Guadalupe River near McQueen, not far from Seguin, will cost $1,500,000, according to W. B. Tuttle, president of the company.

A steam boiler which permits the utilization of powdered Texas lignite for fuel, and is similar to the boilers being used in this capacity at the New Braunfels plant is contemplated for the new unit.

While plans are now being made for the additional unit, it will not be built within the ensuing year, and may not become a reality for two or three years, Mr. Tuttle stated.

The New Braunfels unit was built by the Comal Power Co., a subsidiary corporation to the local company.

Third Plant at Pangan Falls To Operate Next Fall

The Gatineau Power Co., subsidiary of the Canadian International Paper Co., is rapidly extending its business in the province of Quebec and Eastern Ontario, by the acquisition of existing power distributing companies. It recently acquired the Ottawa-Montreal Power Co., and the Quebec Southern Power Co. The Gatineau company now owns and operates in the province of Quebec, 13 hydro-electric developments.

With power already generated from two sites on the Gatineau River, Chelsea and Farmers Rapids, good progress is being made in connection with the third plant at Paugan Falls. It is expected that this latest plant will be ready to operate by the fall of 1928. As a matter of fact, under the contract with the Hydro Electric Commission of Ontario, power is due for delivery Oct. 1, 1928.

Fake Subscription Agent Gets Long Jail Term

Through the efforts of the National Publishers Association, in co-operation with Mr. John Schaefer, manager of the Trade Periodical Service Co., a national subscription agency specializing in trade and technical papers, the fraudulent agent, "Peter Le Gaire," alias "Paul Leland," was tried recently in Philadelphia, found guilty by a jury of the Court of Quarter Sessions, and sentenced by Judge Samuel L. Reed to eighteen months in the County Jail.

This agent, well known to many publishers of trade periodicals, as his practices were confined mostly to that field, began fraudulent solicitation of subscriptions in 1924, and during the latter part of that year and in all of 1925 he operated in Southern, Eastern and Middle Western States, appropriating the name of the Trade Periodical Service Co., 1400 Broadway, New York City. During 1926 and 1927 he used the name of the Trade Journal Circulation Co.

To protect the readers of McGraw-Hill publications against the operations of fraudulent agents, each subscription agent of this company is required to carry an identification slip. The company seal is put across the photograph, so that there can be no chance of substitution.

Kewanee Illinois Boiler Co. Sells Plant

The Kewanee, Illinois Boiler Co. plans for the sale of the plant to the American Radiator Co., which will add the Kewanee steel boiler plant to the American Radiator group of factories, comprising 25 plants in this country and 11 abroad, none of which, however, is a steel boiler plant.

First step in the organization will be the construction of a $200,000 addition for the building of steel heating boilers designed by the Kewanee organization. The riveting system used in the Kewanee plant will be superseded by a steel welding process.

It is announced that there will be no change in management of the Kewanee company of which E. E. Baker is president; B. F. Baker, vice-president; Harry D. Cherry, secretary; M. F. Moore, general manager and R. B. Dickson, sales manager.

Plan Survey of Obsolete Machinery

Plans for a test survey of the mechanical equipment of manufacturing plants of the United States to determine primarily the party played by depreciation and obsolescence in increasing costs of production, and the share of obsolete machinery in over-capacity, have been laid before the Bureau of the Budget.

A request for approval for an appropriation with which the Department of Commerce might employ engineers to make sample examinations in several different localities to determine the value of the plan have been presented. It is understood the plan is endorsed by numerous other members of Congress, whose interest has been solicited by industrial leaders, and that the Department of Commerce is willing to undertake the study if funds are provided.

Over-capacity of manufacturing plants in many lines is attributed by some economists to competition brought about by excess machinery, much of which is obsolete yet serves to produce goods which enter the market against products of more modern machines.

Coal Found Chief Source of Electricity Production

Coal is by far the chief source of power generated at public-utility electric plants in the United States, according to the Geological Survey, Department of the Interior, in announcing that the amount of current produced at such plants in 1926 was 73,791,000,000 kilowatt-hours.

The use of fuel oil in generating electricity has declined since 1924, when it reached its maximum, it was stated, the amount so used in 1926 being only 57 per cent of that used in 1924.

The announcement, in part follows:

The total amount of electricity produced at public-utility power plants in 1926 was 73,791,000,000 kw.-hr. Of this total, 47.5 billion kw.-hr. or 64.5 per cent, was generated by the use of fuels and the remainder by the use of water power. Of the 47.5 billion kw.-hr. produced by the use of fuels, 42.6 billion, or 90 per cent, was generated by the use of coal alone; the remaining 10 per cent of fuel-power output was generated by the use of fuel oil, gas and wood.

Coal is thus by far the chief source of power generated at public-utility power plants. In 1926 the power produced from coal was 57.7 per cent of all the power generated, from water power 35.5 per cent, from oil 3.1 per cent, from gas 3.3 per cent, and from wood 0.4 per cent.

Insull Buys Inland Power & Light Corp.

Sale of the Inland Power & Light Corp., which controls the Missouri Public Service Co. and several other Midwestern utility companies, to Samuel & Son, Inc., and his retirement from the public utility field, was announced Oct. 18 by A. E. Fitkin, who bought the Stock Exchange membership of Walter L. Ross for $240,000, to conduct his firm of A. E. Fitkin & Co. as a general investment and stock exchange house.

Inland Power controls the Kansas Power Co., Missouri Public Service Co., Michigan Public Service Co., Arkansas-Missouri Power Co. and Dallhart Public Service Co. These operating companies furnish electric, gas, water, and in some cases, ice to 58,000 electric customers, 3,600 gas customers and 4,500 water customers in 320 communities.

The electric systems have a capacity of 33,068 kw. and 2,252 miles of transmission lines. The gas systems have plants of 845,000 cu.ft. daily capacity and 123 miles of gas mains. The water systems have a capacity of 12,000,000 gal. daily capacity and 82 miles of mains.

Other properties which Fitkin has sold within the last year have been the National Public Service Corp. and the Western United Corp., National Public Service controls properties in New Jersey, Pennsylvania, Virginia, Georgia and Florida.

Stoker Manufacturing Under Last Year by 9.6 Per Cent

The stoker manufacturing plants of the nation have been operating at a rate under that of the same month of last year ever since April. In September the activity of these plants was 9.6 per cent under September last year, but was 8.8 per cent over September, 1925.

The low point of productive activity during the current year was reached in June, since which time activity has increased by about 14 per cent. The outlook for the immediate future in the stoker manufacturing industry is for slightly more than seasonal expansion, although the operations during the remainder of the year will probably remain slightly under those of the same period last year. Such is the picture of activity in the stoker manufacturing plants of the nation as indicated by the monthly consumption of electrical energy by these plants as reported to *Power*.

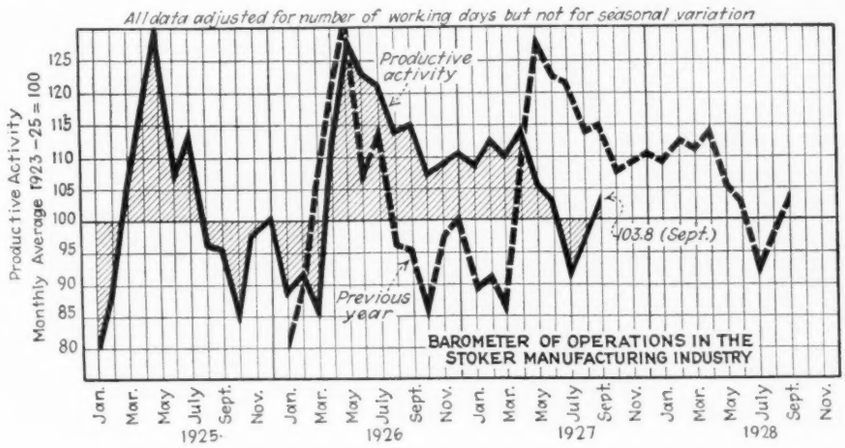
Upward Trend Will Continue

The index of activity in the stoker manufacturing industry based upon electrical energy consumption stands at 103.8 for September, as compared with 97.7 for August, after adjustments are made for the number of working days in the two months. Comparative indexes of productive activity referred to the average activity for the year 1925 as 100, and adjusted for number of working days are as follows:

September, 1927	103.8
August, 1927	97.7
July, 1927	91.2
September, 1926	115.0
September, 1925	95.4
Average for 1st six months 1927	109.1
Average for full year 1926	108.8

In the August 23rd issue of *Power* it was stated that there was every reason to believe that July had witnessed the low point of productive activity and that an upward trend in production was presaged. Reports for August and September have borne out this opinion.

Indications are that this upward trend will continue, or at least that activity during the remainder of the year will not be under that of September. Value of contracts let for the construction of commercial and industrial structures during the first nine months has slightly exceeded similar contracts let during the same period last year—$1,413,073,000 for 1927 and $1,361,264,000 for 1926. The amount which the electric light and power companies of the nation will spend for new steam-plant equipment this year is $252,000,000, practically the same as for 1926. As against this increased construction data is the fact that the aggregate stoker production so far this year has been 3.3 per cent under the same period last year. Based upon these facts, the opinion is expressed that the remainder of 1927 will witness a continued high rate of stoker production.



Personal Mention

Lyndon B. Taylor, mechanical engineer formerly connected with Smith, Hinchman & Grylls, construction engineers of Detroit, is not associated with Sargent & Lundy, Chicago.

Graham L. Montgomery, who for the past six years has been engaged in editorial work with *Chemical & Metallurgical Engineering*, joined the staff of *Power*, October 15.

Edward R. Feicht, formerly plant engineer for the Bridgeport Brass Co., Bridgeport, Conn., is now associated with Collins & Aikman Corp., Philadelphia, as chief engineer.

J. C. Donald, for some time vice-president and manager of the Georgia Power & Light Co., resigned recently. H. A. Neal, general superintendent of the company's interests in Georgia, will succeed to the post.

Stanley S. Seyfert, associate professor of electrical engineering at Lehigh University, has taken a year's leave of absence for study and research at the Massachusetts Institute of Technology.

Frank E. Pitt, member of the A.I.E.E., has joined the Lancashire Electric Power Corp., as district manager. Mr. Pitt was formerly with the Wales Electric Power Distributing Corp.

F. Krug, electrical engineer, has been appointed general manager of the Porto Rico Railway Light & Power Co. Mr. Krug assumed his duties October 18.

Clovis Miller Converse, until recently manager of the power apparatus department of the Great Northern Electric Appliance Co., St. Paul, Minn., is now sales engineer for the G. & W. Electric Specialty Co., Chicago.

Edward E. Lamberson, first assistant chief engineer at the Hudson Avenue station of the Brooklyn Edison Co., has resigned that position to take the post of general superintendent of operation with the Staten Island Edison Co.

Charles A. Greenridge, chief engineer of the J. G. White Management Corp., has recently returned from a three months' visit to the Philippines, where he inspected the electrical properties of his company.

Yasudiro Sakai, consulting electrical engineer, Tokyo, Japan, member of the A.I.E.E., has been appointed by the Imperial Government to serve as a member of the examination board committee for admission to patent attorneyship.

Joseph H. Drake, boiler room engineer of the Trenton Channel plant of the Detroit Edison Co., has taken a leave of absence to broaden his experience by joining the engineering crew of the steamship "Malolo" for an extended cruise.

Major H. G. Howard, of the Whitehall Securities Corp., London and formerly chief engineer of the Cia Chilena de Electricidad, Santiago, Chile, has been appointed hydro-electric engineer to the government of Madras, India. Until recently Major Howard served as chief engineer for the Mexican Light & Power Co., Mexico City.

Dr. D. J. McAdam, Jr., mechanical engineer and metallurgist at the United States Naval Academy Engineering Station at Annapolis, Md., has been awarded the first Charles B. Dudley medal, established by the American Society for Testing Materials, for his paper on "Stress Strain—Cycle Relationships and Corrosion—Fatigue of Metals."

Dr. John Boswell Whitehead, professor of electrical engineering and dean of the School of Engineering of the Johns Hopkins University, recently returned from France, where he served as exchange professor in engineering and applied sciences during the last academic year. He visited and delivered a series of lectures on insulation and the dielectric theory at the Universities Aix Marseille, Grenoble, Lyon, Bordeaux, Toulouse, Caen, Lille, Strasbourg, Nancy and Paris.

Society Affairs

A.S.M.E. Metropolitan Section will hold its fall dinner and smoker at The Hotel Astor, New York City, at 7 p.m., November 4. Reservations may be made through I. L. Martin, A.S.M.E., 29 West 39th St., New York City.

N.A.S.E., Connecticut State Association, will give a banquet and dance Saturday evening, Nov. 5, at the Hotel Taft, New Haven, Conn., in honor of National President Elmer L. Bassett. This banquet is being tendered Mr. Bassett by the combined local associations of the National Association of Stationary Engineers in Connecticut, in conjunction with the Connecticut State Supply Men's Association. Tickets will be $3 a person, and can be obtained from George F. Klopfer, 30 East Pearl St., New Haven, Conn.

A.S.M.E. Iron and Steel Division—The newly formed Iron and Steel Division announces its first national meeting which will be held in Youngstown, Ohio, Nov. 10. C. Snelling Robinson is chairman of the Youngstown committee on arrangements. "Super-Refractories," by C. M. Phelps, Mellon Institute, Pittsburgh, and "Developments of Four-High Rolling Mills," F. C. Biggert, Jr., will be presented in the morning, plant inspection tours will be held in the afternoon and an informal dinner will take place that evening. The meeting will be one of joint co-operation with various sections of the A.S.M.E. and Engineers Clubs in Iron and Steel localities.

Third New England Conference, Springfield, Mass.; Nov. 16-18. Review of the power development in New England and power activities of the New England Council. Group meetings in the Municipal Auditorium, evening of Nov. 18. Address for details Arthur L. Aldred, Statler Building, Boston.

Business Notes

The Chicago Pneumatic Tool Co., 6 East 44th St., New York City, announces the removal of its Cleveland district sales office, effective November 1, from 1241 East 49th St., to 1727 Union Trust Bldg., Cleveland.

The Chain Belt Co., Milwaukee, has purchased the mortar and plaster mixer business of the Atlas Engineering Co. In buying the mixer business of the Atlas Engineering Co. a complete line of mortar and plaster mixers will be added to the Rex line of concrete mixers.

Yeomans Brothers Co., 1433 Dayton St., Chicago, manufacturers of sewage ejectors and pumping machinery, announce the appointment of Dempster Mill Manufacturing Co. at Amarillo as representatives in northwestern Texas to handle the complete Yeomans line, which includes sewage ejectors, bilge pumps, water supply, circulating and other centrifugal pumps and condensation return pumps.

Coming Conventions

American Boiler Manufacturers Association, winter meeting, Hotel Cleveland, Cleveland, Feb. 7; A. C. Baker, sec., 801 Rockefeller Bldg.

American Society of Heating & Ventilating Engineers, hold general meeting in New York City, during 4th week in January; A. V. Hutchinson, sec., 29 W. 39th St., New York.

American Society of Refrigerating Engineers, annual convention in New York, Dec. 5-7; W. H. Ross, sec., 37 W. 39th St., New York City.

American Water Works Association. North Carolina Section, at Durham, Nov. 7-9; H. G. Baity, sec., Univ. North Carolina, Chapel Hill; Section, at Council Bluffs, Annual meeting, Hotel Fairmont, San Francisco, June 11-16; W. M. Niesley, 170 Broadway, New York City.

American Society of Mechanical Engineers, convention during week of New York Power Show, New York City, Dec. 5-10; Calvin Rice, sec., 29 West 39th St., New York City.

Midwest Power Conference and Exhibition, at Chicago, Feb. 14-17; G. E. Pfisterer, sec., 53 West Jackson Blvd., Chicago.

National Association of Practical Refrigerating Engineers. Eighteenth annual convention and educational exhibition in Civic Convention Hall and headquarters Hotel Whitcomb, San Francisco, Calif., Nov. 29 to Dec. 2. H. Fox, 5707 W. Lake St., Chicago, Ill.

National District Heating Association, annual meeting in May; D. L. Gaskill, sec. 112 West 4th St., Greenville, Ohio.

New York Power Show (National Exposition of Power and Mechanical Engineering) will be held at the Grand Central Palace, New York City, Dec. 5-10. Address inquiries to the International Exposition Co., Grand Central Palace.

Society of Naval Architects and Marine Engineers, Thirty-fifth general meeting will be held in the Engineering Societies Building, 29 West 39th St., New York City, Nov. 10-11. Papers of interest to power engineers will be offered Nov. 11.

National Engineers' Beneficial Association, Fifty-third annual convention will be held in Washington, D. C., Feb. 14. Headquarters to be announced hereafter; Albert L. Jones, secretary treasurer, 313 Machinists' Bldg., Washington, D. C.

Power Transmission Association. Annual meeting, Hotel Commodore, New York City, Dec. 7; W. S. Hays, Sec., Drexel Building, Philadelphia.

The Falk Corp. announces that arrangements have been made with William Kennedy & Sons, Ltd., Owen Sound, Ontario, whereby this company is to manufacture and sell Falk continuous tooth herringbone gears, Falk herringbone speed reducers and Falk flexible couplings in Canada.

Fuel Prices

COAL

The following table shows the trend of the spot steam market in various coals, f.o.b. mines; mine run, except Pittsburgh gas slack:

Bituminous (Net Tons)	Market Quoting	Oct. 19 1927
Pool 1	New York	$2.35@$2.75
Smokeless	Boston	1.48
Clearfield	Boston	1.60@1.85
Somerset	Boston	1.70@1.90
Kanawha	Columbus	1.50@1.65
Hocking	Columbus	1.60@1.90
Pittsburgh	Pittsburgh	1.75@1.90
Pittsburgh gas slack	Pittsburgh	1.10@1.25
Franklin, Ill.	Chicago	2.25@2.50
Central, Ill.	Chicago	2.00@2.25
Ind. 4th Vein	Chicago	2.50
West Ky.	Louisville	1.40@1.65
S. E. Ky.	Louisville	1.40@1.75
Big Seam	Birmingham	1.75@2.00
Anthracite (Gross Tons)		
Buckwheat No. 1.	New York	2.90@3.25
Buckwheat No. 1.	Philadelphia	3.00@3.75
Birdseye	New York	1.60

FUEL OIL

New York—Oct. 27, light oil, tank-car lots; 28@34 deg. Baumé, 5¼c. per gal.; 36@40 deg., 5½c. per gal. f.o.b. Bayonne, N. J.

St. Louis—Oct. 20, tank-car lots, f.o.b. St. Louis; 24@26 deg., $1.55 per bbl.; 26@28 deg., $1.60 per bbl.; 28@30 deg., $1.65 per bbl.; 30@32 deg., $1.70 per bbl.; 32@36 deg., gas oil, 4.4c. per gal.; 38@40 deg., 5¼c. per gal.

Pittsburgh—Oct. 8, f.o.b. local refinery; 30@34 deg., fuel oil, 4⅜c. per gal.; 36@40 deg., fuel oil, 4⅝c. per gal.

Philadelphia—Oct. 20, 26@30 deg., $2@$2.06 per bbl.; 13@19 deg., $1.68@$1.74 per bbl.; 22 plus, $1.79@$1.85; 27@30, $2.10@$2.16.

Cincinnati — Oct. 24, tank-car lots, f.o.b. local refinery, 24@26 deg. Baumé, 4.9c. per gal.; 26@30 deg., 5.15c. per gal.; 30@32 deg., 5½c. per gal.

Chicago—Oct. 22, tank-car lots, f.o.b. Oklahoma, freight to Chicago, 90c. per bbl.; 22@26 deg., 87½c. per bbl.; 26@30 deg., 90c.; 30@32 deg., $1.05.

Boston—Oct. 24, tank-car lots, f.o.b. 12@14 deg. Baumé, 4¼c. per gal.; 28@32 deg., 5⅜c. per gal.

Dallas—Oct. 22, f.o.b. local refiners, 26@30 deg., $1.45 per bbl.

Trade Catalogs

Steam Engines—The Elliott Co., Jeannette, Pa., in Bulletin B-1, which comprises thirty-four pages of information and descriptive matter, cover unaflow, four-valve and single-valve engines. In the fore part of the catalog is a discussion of the fields of the three types of engines, the differences between the en-

gines, and a chart showing relative steam consumptions is shown. Each type of engine is treated in detail, and many sectional and installation views are shown. Copies will be sent upon request.

SPRAY COOLING SYSTEMS — Binks Spray Equipment Co., engineers and manufacturers, Chicago, in an illustrated leaflet treats of the Binks spray cooling systems, cooling towers, and "Spra-Rite" nozzles.

CHAIN HOISTS — The Dickerman Hoist Manufacturing Co., Cleveland, in Bulletin No. 21 describes the new spur-geared ball bearing chain hoist of the company. The Dickerman line also includes differential chain hoists, steel plate trolleys with ball bearings and steel plate trolleys with Timken bearings. These are mentioned on the last page of the bulletin.

VALVES—The I. P. Morris Corp., Philadelphia, has issued Bulletin No. 8 treating of Larner-Johnson valves for water works service, including check valves and foot valves for centrifugal pumps, automatic valves to close in case of a broken pipe line or similar emergency; throttling valves for controlling flow to branch lines; free discharge regulators for controlling flow from storage reservoirs, and pressure regulating valves.

DIESEL ENGINES—The Otto Engine Works, Philadelphia (Holmesburg), Pa., and the Superior Gas Engine Co., Springfield, Ohio, in Bulletin 114 describes Superior-Otto Diesel engines. These are vertical four cycle, airless injection cold starting from sizes 60 to 360 hp. Many well-executed illustrations depict several views of a number of sizes and types.

DIRECT-CONNECTED TURBINE GENERATOR UNITS — The Westinghouse Electric & Manufacturing Co., South Philadelphia Works, has recently released a leaflet entitled "Direct Connected Turbine Generator Units—Capacities 5, 7½, 10 and 15 Kw." These units are for 125 and 250 volts direct-current operation. The number of the new leaflet is 2000-D. Included are a number of photographs showing the construction and operation of these units. Those leaflets may be obtained at any of the district offices of the Westinghouse company or at the Advertising Department at East Pittsburgh, Pa.

INDUCTION MOTORS—Bulletin No. 102 of the Reliance Electric & Engineering Co., Cleveland, describes a new line of fully enclosed, fan-cooled induction motors with ball bearings. These motors are known as Type AA and are cooled by fans blowing air over the outside of the motor frame.

SINGLE-STAGE CENTRIFUGAL PUMPS —The Ingersoll-Rand, A. S. Cameron Steam Pump Works, 11 Broadway, New York City, has devoted an illustrated pamphlet to the description of Cameron single-stage, double-suction centrifugal pumps, suitable for belting or direct connection. Class "LV" pumps are made in sizes from No. 2 to No. 8 with capacities ranging from 100 to 2,500 g.p.m. and for head conditions up to 200 ft. Class "NFV" pumps are of the low-head type for capacities from 100 to 100,000 g.p.m., and for heads up to 175. Class "HV" is built for higher heads, in sizes from No. 2 to No. 24, with capacities ranging from 100 to 30,000 g.p.m. and for heads up to 300 feet.

NEW PLANT CONSTRUCTION

Ala., Birmingham—T. H. Watts, Jr., awarded contract for a 16 story office building on 20th St. to C. M. Allen & Son, 408½ North 19th St. Estimated cost $1,000,000.

Ala., Mobile — Alabama State Docks Comn., awarded contract for foundation for a coal and material handling plant to Doullut & Ewin, Q. and C. Bldg., New Orleans, La. Estimated cost $230,667.

Calif., Berkeley—University of California, is having plans prepared for the construction of a dormitory at Piedmont Ave. and Bancroft Way. Estimated cost $1,750,000. G. W. Kelham, 315 Montgomery St., San Francisco, is architect.

Calif., Long Beach — L. V. Mayell, 41 Kennebee Ave., awarded contract for the construction of a 16 story office and apartment building at Ocean Blvd. and Alamada St. to Kinne & Westerhouse, Black Bldg., Los Angeles. Estimated cost $1,000,000. Steam heating and electric refrigeration systems, elevators, etc. will be installed.

Calif., Los Angeles—Edwards & Wildey Co., 609 South Grand Blvd., plans the construction of a waterworks system including, reservoir, pumping plant, etc. Estimated cost $200,000.

Calif., Los Angeles — Small, Asher & Rogers, c/o Walker & Eisen, Western Pacific Bldg., plans the construction of a 13 story apartment building on Rossmore Ave.

Calif., Los Angeles—F. R. Strong, Rives-Strong Bldg., T. B. Barnett, W. R. Wheat, 112 West 9th St. and E. Riggs, plan a 6 story office and stores building at Hollywood Blvd. and Wilcox and Cahuenga Aves. Estimated cost $500,000. Architect and engineer not selected.

Calif., San Francisco—Lane Hospital, Clay and Webster Sts., is having preliminary plans prepared for hospital at Clay and Webster Sts. Estimated cost $1,000,000. Bakewell & Brown, 251 Kearny St., are architects.

Calif., Santa Barbara—A. L. Richmond, et al, c/o G. S. Underwood, Hibernian Bldg. Los Angeles, Archt., had plans prepared for the construction of a hotel on State St. here. Estimated cost $500,000.

Ill., Chicago — Chicago-Nash Co., H. T. Hollingshead, Pres., 2000 South Michigan Ave., awarded contract for the construction of an automobile building and boiler house at 24th St. and Prairie and Indiana Aves. to Kelly-Atkinson Co., 189 West Madison St.

Ill., Chicago — Syndicate, c/o Quinn & Christianson, 360 North Michigan Ave., awarded contract for masonry, etc. for a 13 story apartment building including steam heating and refrigeration systems, elevators, etc. at 6700 Crandon Ave. Estimated cost $900,000.

Ill., Chicago — Syndicate, c/o Quinn & Christianson, 360 North Michigan Ave., Archts., awarded contract for a 17 story apartment building at 5520 Sheridan Rd. to H. Janisch & Co., 1801 Winona St. Steam heating system, etc. will be installed.

Ill., Oak Park—Meyer & Cook, 820 Tower Court, Archts., will soon receive bids for apartment building including electric refrigeration system, etc. at Ontario and Kenilworth Ave. Owner's name withheld.

Ind., Hammond — Kaufman & Wolf, awarded contract for the construction of a department store on Hohman St. to H. B. Olney Co., East Chicago. Estimated cost $1,250,000.

La., Baton Rouge—City plans an election to vote $180,000 bonds for the construction of a pump house, also laying of sewer line. L. J. Voorhies, is engineer.

Mass., Boston — Commonwealth Ice & Cold Storage Co., A. L. Parker, 220 Northern Ave., is receiving bids for addition to fish handling plant. E. N. Pike, 33 Chauncy St., Boston, is architect.

Mass., Boston—Edison Electric Illuminating Co., 39 Boylston St., awarded contract for a sub-station at 31-33 Hawkins St. to F. T. Ley Co. Inc., 20 Providence St.

Mass., Cambridge (Boston P. O.)—Dept. of Public Welfare, awarded contract for the construction of a city home, power house, etc. on Concord Ave. to Askin & Sullivan, 580 Massachusetts Ave. Estimated cost $250,000.

Mich., Detroit — Boydell Bros. White Lead & Color Co., Pelmar and Cardoni Ave., awarded contract for the construction of a factory including 30 x 45 ft. power house, etc. at Palmer Blvd. to C. O. Barton, 508 Free Press Bldg.

Mich., Detroit — Chevrolet Motor Corp., 3044 West Grand Blvd., will receive bids about Oct. 27, for addition to power plant.

Mich., Detroit—William A. Montgomery, 2006 Penobscot Bldg., had plans prepared for an 8 story apartment building including steam heating, refrigeration and ventilation systems, boilers, elevators, etc. on Third Ave. H. J. Haughey, 112 Madison Ave., is architect.

Mich., Highland Park (Detroit P. O.)—Chrysler Motor Corp., 341 Massachusetts Ave., is having plans prepared for the construction of a factory including detached power plant, Smith, Hinchman & Grylls, 800 Marquette Bldg., Detroit, are engineers.

Mo., St. Louis—Lafayette Realty Co., c/o P. J. Bradshaw, International Life Bldg., will soon receive bids for the construction of a 22 story hotel including steam heating system, etc. at 12th Blvd. and Pine St. Estimated cost $3,000,000. W. J. Knight, Wainwright Bldg., is engineer.

Mo., St. Louis—Syndicate, c/o C. E. Etz, 110 North Seventh St., Archt., awarded contract for a 3 story apartment at South Kings Highway to W. H. Smith, 110 North 7th St. Estimated cost $500,000. Steam heating, system, etc. will be installed.

N. J., Belmar—City awarded contract for the construction of a pumping station to Thomas Proctor, Long Branch. Estimated cost $44,800.

N. J., Hoboken—Stanley-Fabian Co., 17 Academy St., awarded contract for a 21 story theatre at Washington and Newark Aves., to John W. Ferguson Co., 152 Market St., Paterson. Estimated cost $1,000,000. Steam heating system, etc. will be installed.

N. J., Jersey City—American Can Co., 120 Broadway, New York, N. Y., is having plans prepared for the construction of a factory, boiler room, etc. at St. Pauls Ave.

and Erie R. Rd. Estimated total cost $2,000,000. C. G. Preis, 120 Broadway, New York, N. Y., is architect and engineer.

N. J., Newark—Newark Auditorium Inc., 671 Broad St., awarded contract for the construction of a 20 story hotel and theatre, etc. at Washington and James Sts. to Charles T. Wills, Inc., 286 5th Ave. Estimated cost $6,000,000. Steam heating and refrigeration systems, boilers, pumps, elevators, etc. will be installed.

N. J., Verona (br. Montclair) — Inwood Consumers Ice Mfg. Corp., will soon award contract for the construction of an ice plant. Estimated cost $40,000. Wigton-Abbott Corp., 552 West 23rd St., New York, N. Y., is architect and engineer.

N. Y., New York — Downtown Athletic Club, 149 Broadway, is having plans prepared for the construction of a club building at West Morris St. and Battery. Estimated cost $2,225,000. Starrett & Van Vleck, 393 7th Ave., are architects. J. G. White Engineering Corp., 43 Exchange Pl., is engineer.

N. Y., New York—A. A. Paterno, 2300 Broadway, is having plans prepared for the construction of a 14 story apartment building at 25 Sutton Pl. Estimated cost $500,000. R. Candela, 578 Madison Ave., is architect.

N. Y., New York—Six to Sixteen West Seventy Seventh St. Corp., 9 East 40th St., will build a 15 story apartment building at 6 West 77th St. Estimated cost $2,000,000. N. Korn, 9 East 40th St., is architect. Work will be done by separate contracts.

N. Y., Rochester—Bonarge Corp., New York, awarded contract for masonry, etc. for a theatre and commercial building, here. Estimated cost $1,500,000.

O., Cincinnati—City, A. Marcus, Clk., will receive bids until Nov. 8, for the construction of a group of buildings including power plant, etc. for University of Cincinnati.

O., Cincinnati—Fountain Square Building Co., 2400 Gilbert Ave., awarded contract for the construction of a 20 story office building at Fifth and Walnut Sts. to J. & F. Harig, 1240 Queen City Ave. Estimated cost $1,000,000.

Okla., Bristow — City plans an election Nov. 15 to vote $44,000 bonds for waterworks improvements including triplex pump and motor, mains, etc. C. L. Wilson, Weatherford, is engineer.

Okla., Oklahoma City — Oklahoma State Athletic Club, c/o M. E. O'Neil Secy., 607-609 Petroleum Bldg., is having plans prepared for a 10 story club building including steam heating system Estimated cost $750,000. Architect not selected.

Okla., Purcell — City is having preliminary plans prepared for waterworks improvements including impounding reservoir, dam, filter plant, pumping equipment, etc. Estimated cost $90,000. Horner & Wyatt, 408 Bd. of Trade Bldg., Kansas City, Mo., are engineers.

Okla., Tulsa—American Exchange Trust Co., Boston St., awarded contract for masonry, etc. for a 24 story bank and office building. Estimated cost $1,000,000.

Pa., Pittsburgh—Tuberculosis League of Pittsburgh, 2851 Bedford St., awarded contract for a 6 story hospital to Mellon Stuart Co., Oliver Bldg. Estimated cost $500,000.

Pa., Safe Harbor—Pennsylvania Water Power Co., 40 Wall St., New York, N. Y., is having tentative plans prepared for the construction of a hydro-electric plant and dam, 200,000 hp. capacity including power house, etc. on Susquehanna River, here. Estimated cost approximately $30,000,000.

Texas—San Antonio Public Service Co., W. B. Tuttle, 201 North St., Marys St., San Antonio, is having plans prepared for the construction of a 40,000 hp. additional steam power plant to increase the capacity, to be built either in conjunction with New Braunfels unit or on the Guadalupe River near McQueen. Estimated cost $1,500,000. Private plans.

Tex., Boerne—City plans the construction of a waterworks system including power unit, etc. Estimated cost $75,000. Terrell Bartlett Engr., 612 Calcasieu Bldg., San Antonio, are engineers.

Tex., Cross Plains — E. J. Roberts, Fort Worth, has acquired a site and plans the construction of a 30 ton ice plant. Estimated cost $40,000.

Tex., Dayton — Guld States Utilities Co., E. S. Fitz, Beaumont, awarded contract for the construction of an electric substation here, to Stone & Webster, 147 Milk St., Boston, Mass. Estimated cost $150,000.

Tex., Denton — Home Ice Co., c/o H. Kerley, is having preliminary plans prepared for the construction of a 30 ton ice plant, probably electrically operated. Estimated cost $45,000. Engineer not selected.

Tex., Quanah—West Texas Utilities Co., Abilene, had plans prepared for first unit of power plant, 15,000 kw. capacity here. Estimated cost $250,000. Private plans.

Tex., Saint Jo—Saint Jo Oil & Gas Co., plans drilling of oil wells, also the construction of a pumping station. Estimated cost $100,000.

Tex., San Antonio—Woodmen of the World, c/o W. A. Fraser, Omaha Neb., has acquired a site and plans the construction of a group of hospital buildings. Estimated cost $1,000,000.

Tex., Texas City—Texas Gulf Power Co., Galveston, is having plans prepared for the construction of a power plant here. Estimated cost $300,000. Private plans. Complete machinery and equipment will be required.

B. C., Vancouver—Royal Band of Canada, C. E. Neill, 147 St. James St., Montreal, Que., plans the construction of a bank and office building at Hastings and Granville Sts. Estimated cost $1,500,000 to $2,000,000. Architect and engineer not announced.

Ont., Kapuskasing—Spruce Falls Power & Paper Co., J. H. Black, Gen. Mgr., awarded contract for the construction of an electric power plant, also paper mill, 500 ton newsprint daily capacity to Morrow & Beatty, Peterboro. Estimated cost approximately $5,000,000.

Equipment Wanted

Air Compressor and Breaker—P. Gilmore, Clk., Whittier, Calif., plans to purchase an air compressor for city water department.

Boiler—Division of Standards, Executive Dept., Albany, N. Y., will receive bids about December for a boiler for proposed extensions to laundry at New York State Orthopedic Hospital for children, West Haverstraw, N. Y.

Compressors, Motors, Etc.—International Combustion Engine Corp., 200 Madison Ave., New York, N. Y., plans to purchase compressors, motors, etc. for proposed low temperature carbonization gas plant at Silver Lake, Piscatawaytown, N. J. Estimated cost $1,500,000.

Compressors, Motors, etc.—Union Carbon & Carbide Co., 30 East 42nd St., New York, N. Y., plans to purchase compressors, motors, etc., for proposed plants at Hastings and Charleston, W. Va. Estimated cost $1,900,000 and $500,000 respectively.

Engine and Generator Pumps, Etc.—City of Tahlequah, Okla., plans to purchase a 360 hp. Diesel engine and generator for proposed light plant, also two motor driven centrifugal pumps for proposed filter plant. Estimated cost $40,000.

Gasoline Engines—Supt. of Lighthouses, Staten Island, N. Y., will receive bids until Nov. 7, for four 38 ft. buoy boats complete with cylinder gasoline engines.

Generator Sets—Bureau of Yards & Docks, Navy Dept., Washingotn, D. C., will receive bids until Nov. 2 (extended date) for motor generator sets for Navy Yard, Puget Sound, Wash.

Generating Units, Pumps, Etc.—Dept. of Public Works, J. W. Summit, Comr., Palmetto, Fla., will receive bids until Nov. 22, for a 125 hp. Diesel oil engine generating unit complete with generator, exciter, motor driven pumps, also a 50 hp. vertical Diesel generating unit, 257 r.p.m. with exciter, switchboard, etc.

Ice Plant Equipment—Gibbs & Co., Jasper, Tex., plans to purchase machinery and equipment for proposed extensions and improvements to ice and cold storage plant. Estimated cost $20,000.

Pumping Equipment — City of Durham, N. C., will receive bids until Nov. 17 for pumping equipment, etc., for proposed sewage disposal plant. Estimated cost $170,000.

Pumping Equipment, etc.—City of Ironton, Mo., will receive bids until Nov. 2 for pumping equipment, etc., for proposed waterworks improvements.

Pumping Equipment, Etc.—City of Sinton, Tex., plans to purchase pumping equipment, etc. for proposed waterworks improvements.

Pumping Unit — City of Boerne, Tex., plans to purchase a pumping unit for proposed waterworks improvements. Estimated cost $75,000.

Pumps, Etc.—City of Minneapolis, Minn., plans to purchase a 0,000,000 g.p.m. pump for Fridley pumping station, 42nd Ave. N. E. and Marshall St.

Pumps, etc.—City of Irving, Kan., will soon receive bids for pumps, etc., for proposed waterwroks improvements. Estimated cost $25,000.

Pumps, etc. — Dept. of Water Supply, Detroit, Mich., plans to purchase two 240,000,000 g.p.d. electrical driven pumps, with synchronous motors to discharge into coagulation basins.

Pumps, etc.—J. W. Smith, Recorder, Osseo, Wis., will soon receive bids for pumps, etc., for proposed waterworks and sewage disposal plant. Estimated cost $25,000.

Stokers, Blowers, Etc.—Dept. of Public Works, Milwaukee, Wis., will receive bids until Nov. 4, for moving and resetting two 300 hp. horizontal water tube boilers, also furnishing and installing mechanical stokers, blowers, power plant piping, etc. at North Point pumping station. Estimated cost $44,000.

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